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APRIL 1972 VOLUME 57 NUMBER 4

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FRONT COVER

The thrill of hard sailing is captured in this magnificent shot of an ocean racer running fast in a quartering wind. *Photograph by Gerry Cranham/Sports Illustrated.*

NEXT MONTH

Submarine cables, potato lifting, Big Ben, and another full-size model plan are some of May's contents.

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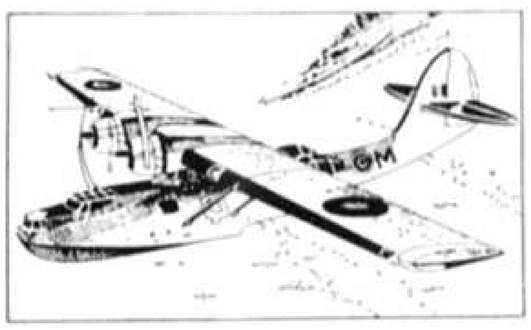

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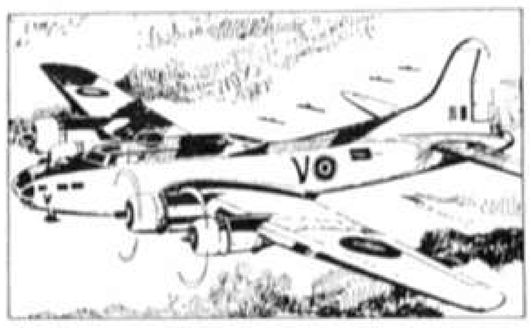

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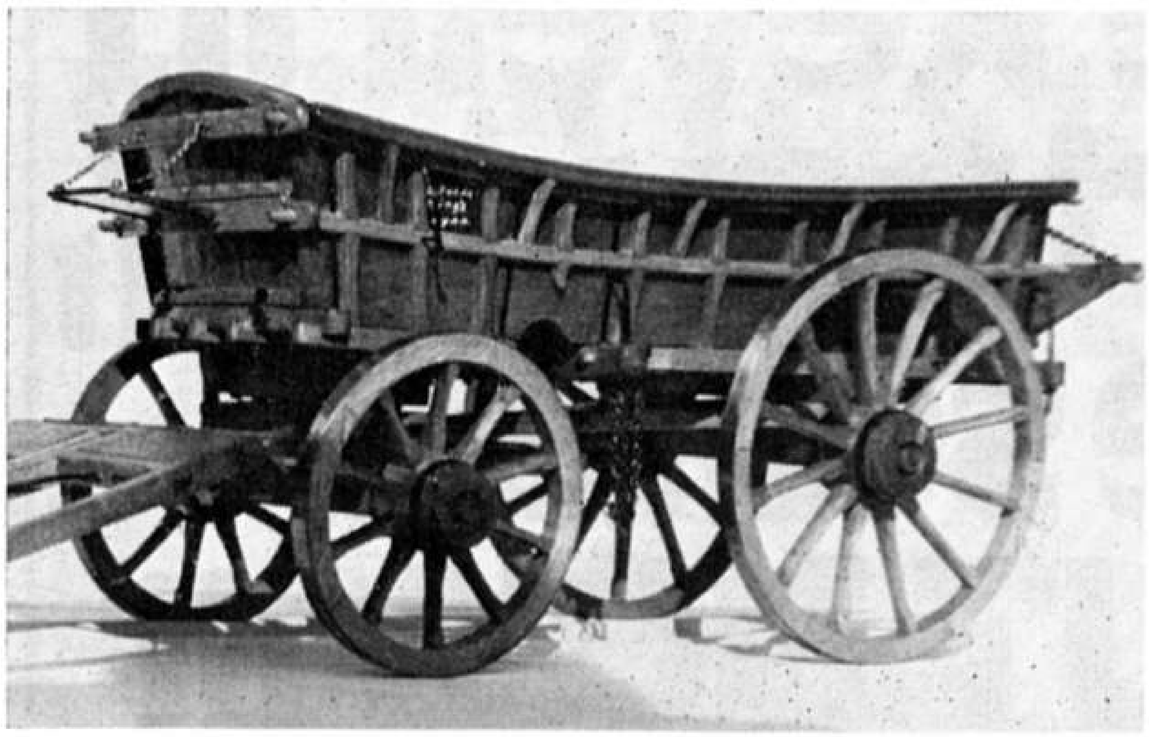

Reports on the locomotives and traction engines at the recent Model Engineer Exhibition.

A West Country reader describes his outdoor model tramway.

There are details of the boiler for the M.E. Gauge 1 steam locomotive – a scale model of the ex-L.N.E.R. "Green Arrow."

Another article describes the building of an unusual type of model – an East Anglian farm wagon.

Model Engineer

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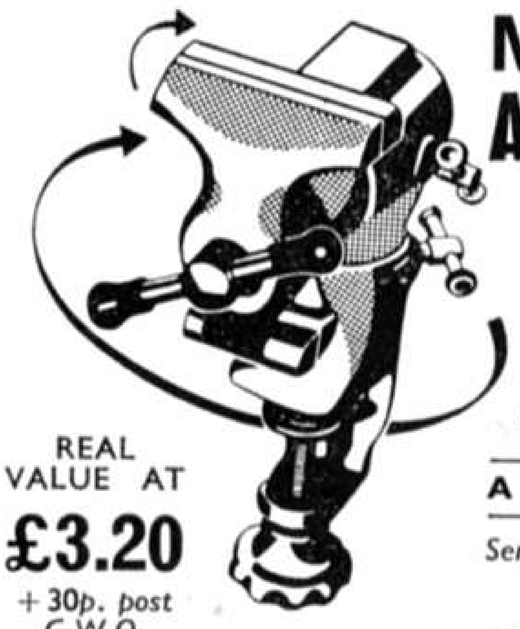

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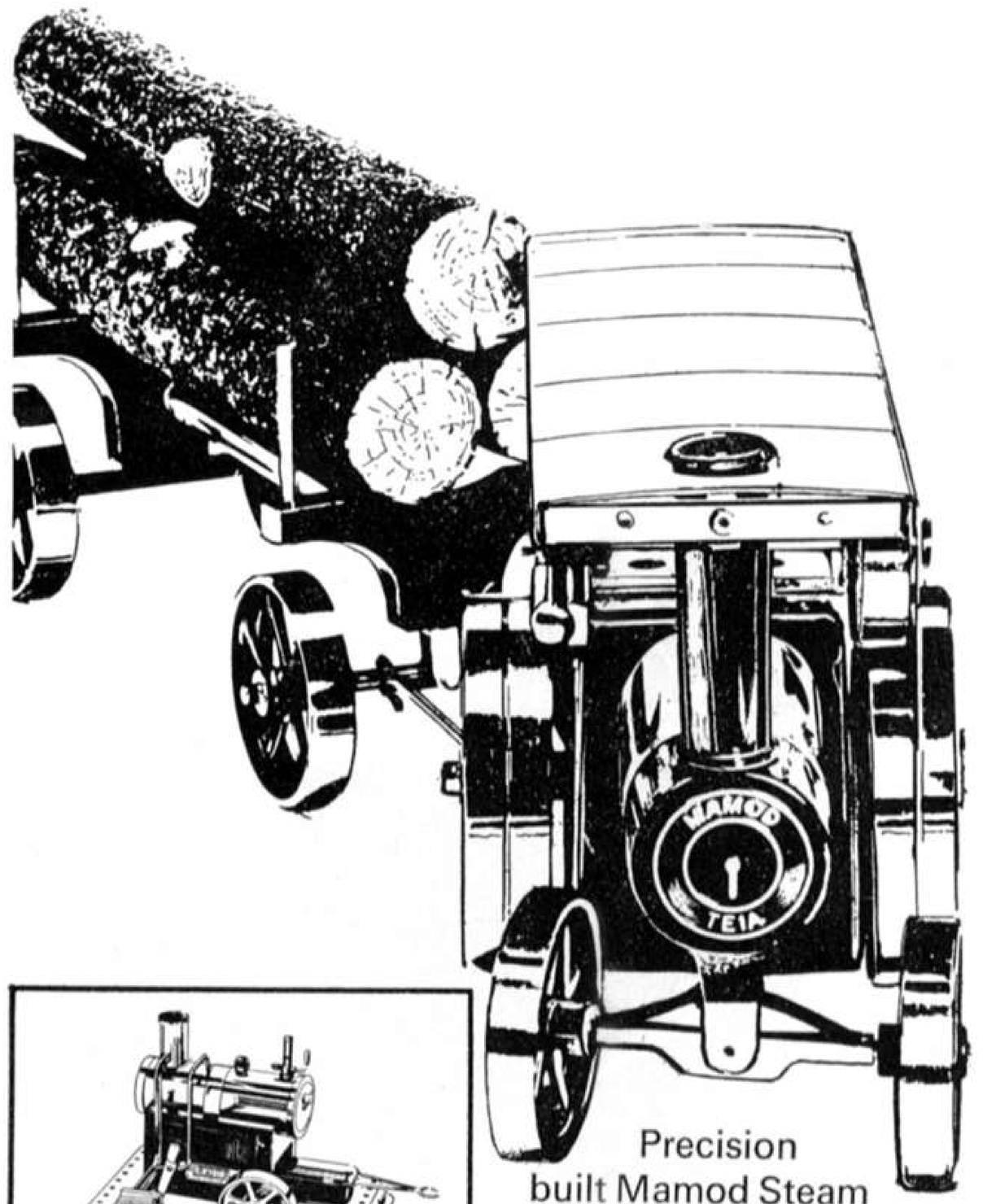

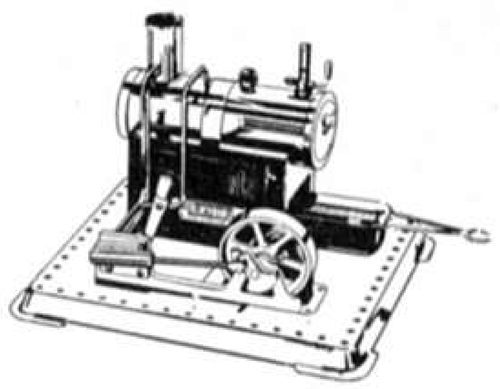

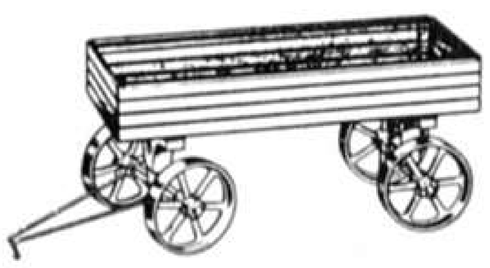

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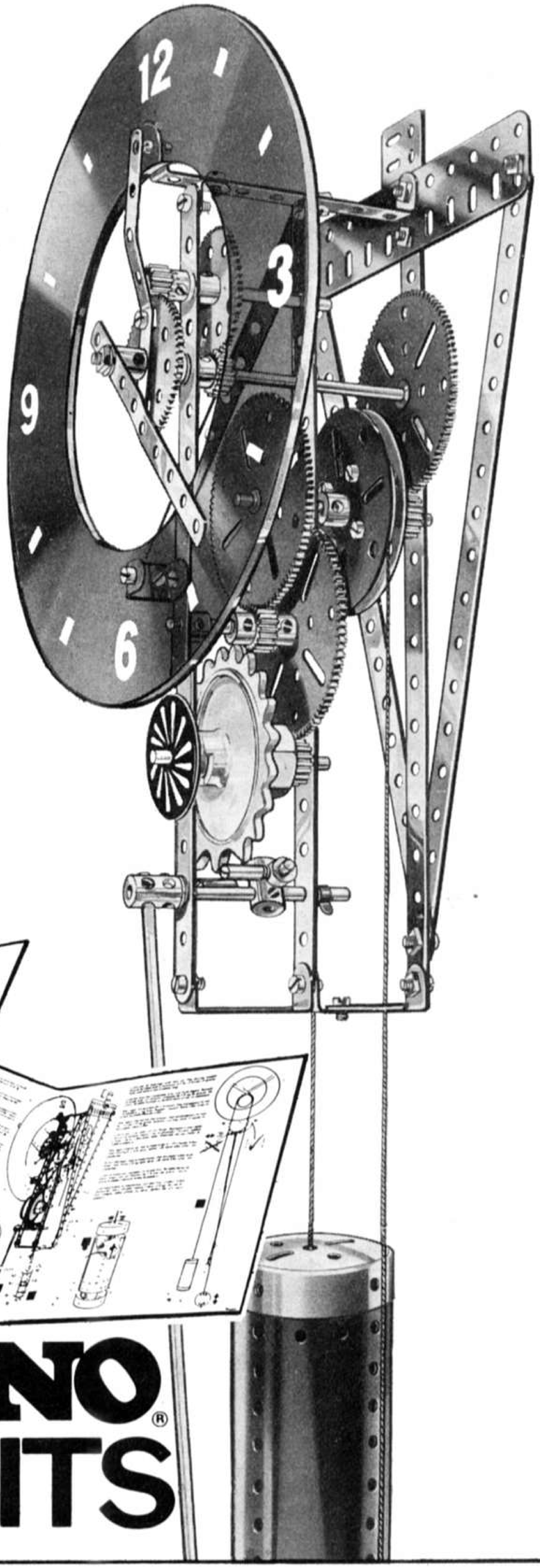

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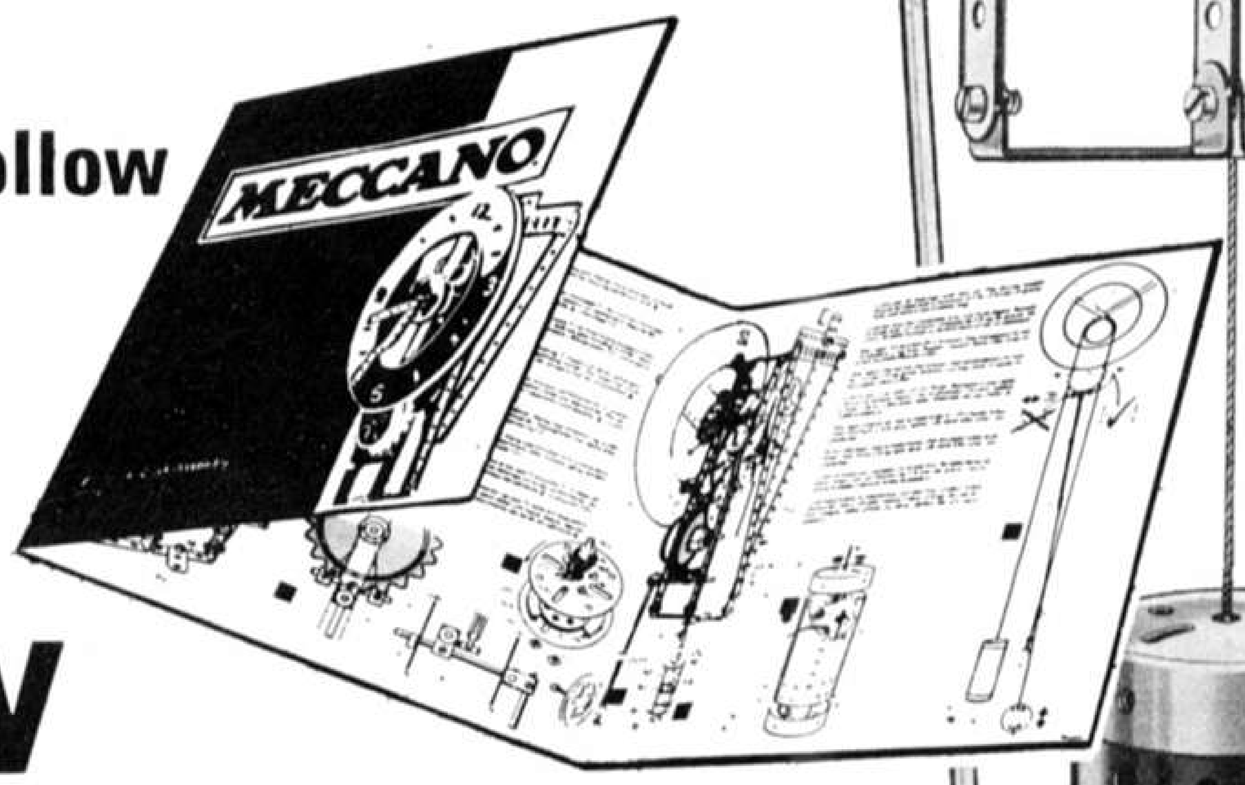

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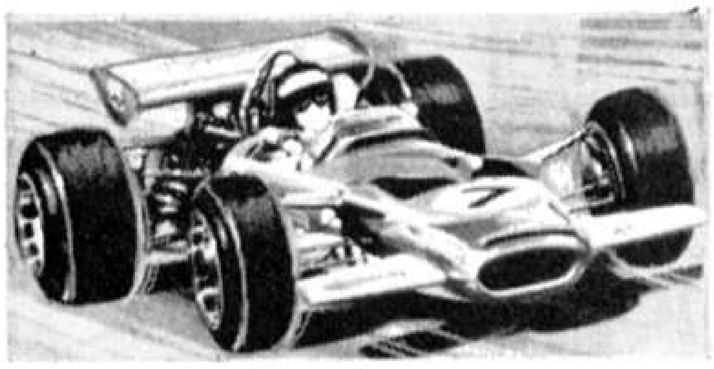

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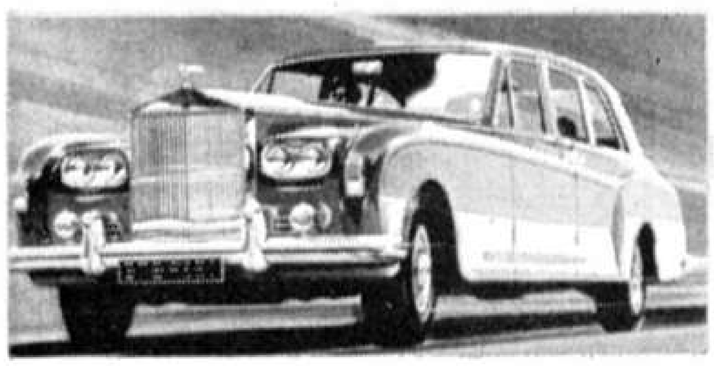

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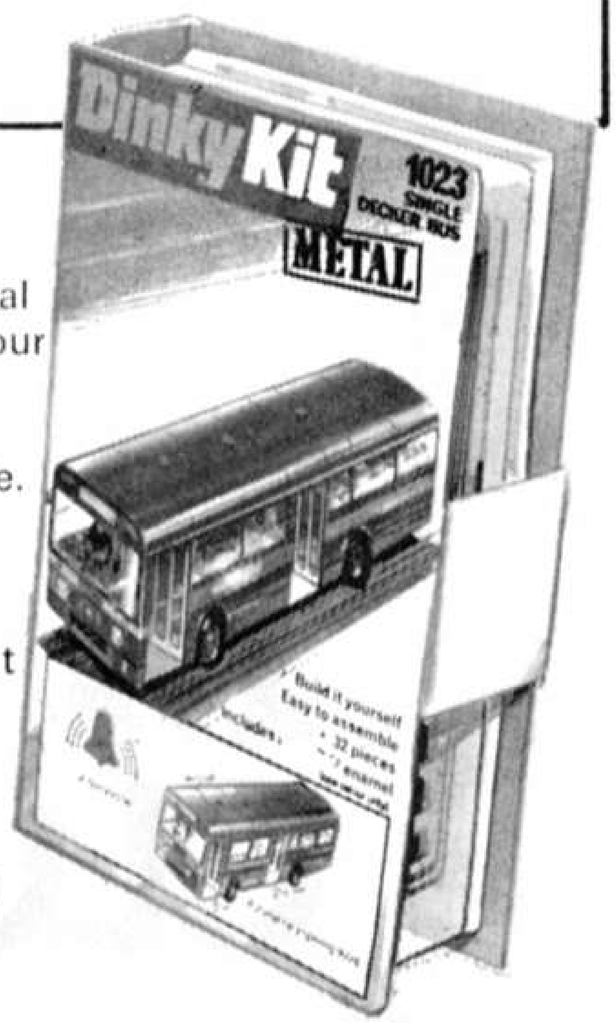

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THE M.E. Exhibition is over for another year, and once again the attendance reached new levels, both for a daily record and the overall total. It is not, however, only the people who attend the exhibition who have models brought to their attention; many local newspaper readers will have seen photographs and details of entries from their particular area, there is some national press coverage, film in the form of Movietone News, television appearances and sound broadcasts, some of which, in the appropriate languages, are transmitted for the interest of BBC listeners overseas.

Television this year featured models in the Aquarius magazine programme and "Blue Peter" and "Magpie," as well as other short snippets, and there were several mentions on sound. No doubt this contributed to the crowds that came to see the exhibition, but even those who couldn't come were certainly made aware of how vast a subject modelling now is.

In connection with this particular magazine, it seems all the more of a pity that there were not more Meccano entries, especially as some visitors specifically asked about them. One comment was that it was not made sufficiently clear that there is in fact a Meccano class for judging, so if this was a reason, may we point out now that there *is* such a class, with an attractive cup for the winner, and cash prizes if the entry is sufficiently large. An ingenious small model would stand a chance of winning equally as great as a large and elaborate one; it is early days to be thinking of an entry for next year, but it is certainly something to bear in mind.

Toy Fairs

The beginning of the year is always the time for the major toy fairs at Harrogate and Brighton and, the biggest of them all, at Nuremberg. Buyers from the toy and model trades have the opportunity of seeing what products will be available during the coming year, and the orders received by the manufacturers allow them to plan their production lines to meet the flow of demand which, of course, builds up to a peak in the Autumn when shops are stocking up for Christmas. Some of the goods are shown in prototype form and production is not planned until later in the year.

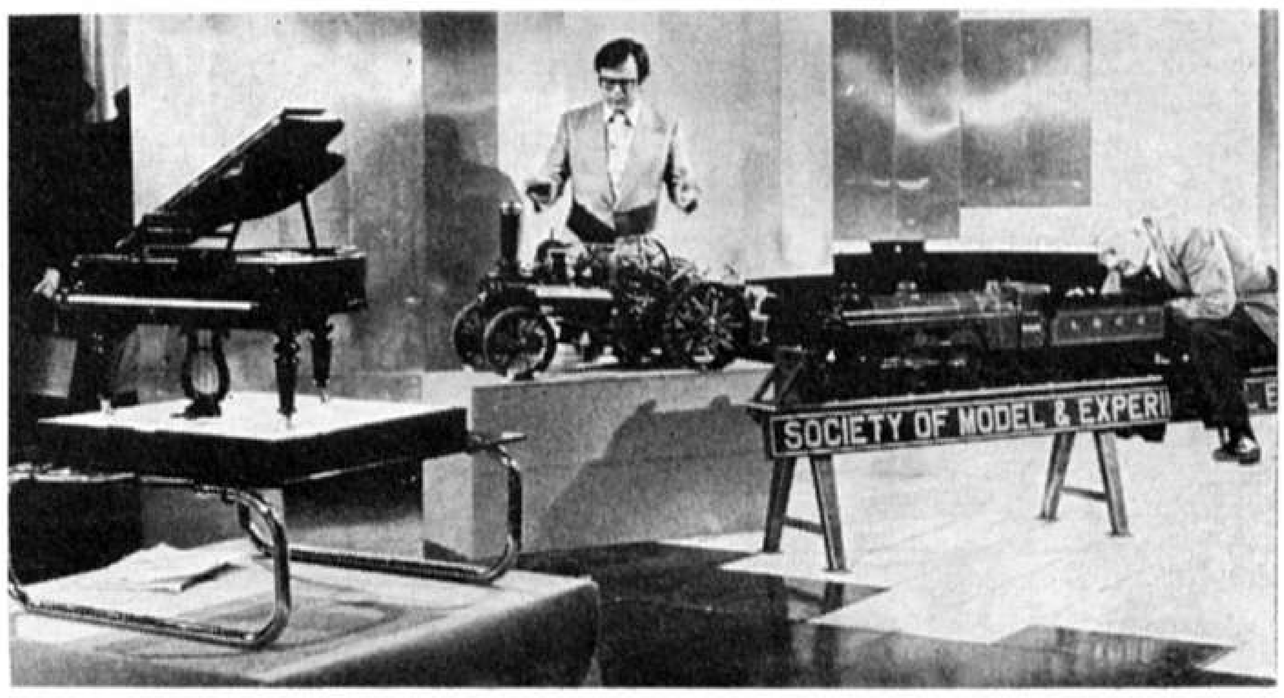
Our picture shows part of the Meccano (1971) Ltd. display at Brighton, where business was brisk—as indeed it was elsewhere. Keen eyes may discern a future Meccano project, a clock kit, (two in fact) which, however, will not be available till later on. Rest assured we shall give ample notification of the release of these attractive new products when the time comes.

Power

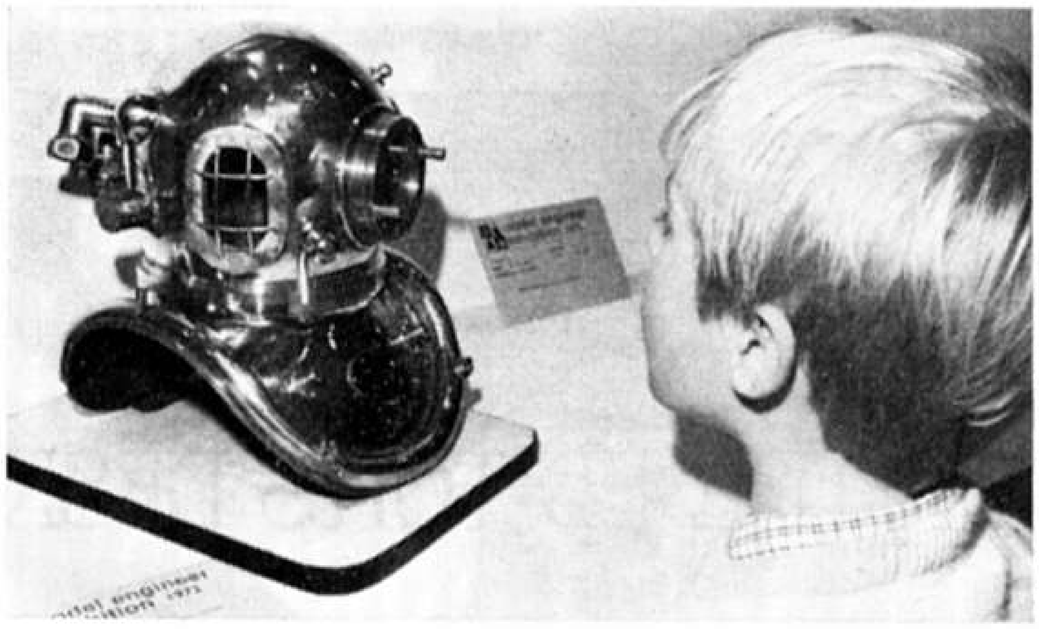
These notes are written during a power cut and, under regulations just coming into force, large industrial users of electricity are being limited in the number of days they can work each week. As readers will realise, this affects printers, most of whom already work day and night to produce magazines etc. on time. It is naturally our hope that the dislocation of production will not mean a delay in publication of this issue, but this must depend on the severity and timing of the power black-outs. If you didn't get this copy on the usual day, please accept our apologies; the circumstances are, as you will realise, totally beyond our control.

Model Railway Exhibition

Macclesfield Model Railway Group is running an exhibition on Friday April 21 (12–9), Saturday 22 (10–9) and Sunday 23 (10–7) at the Drill Hall, Bridge Street, Macclesfield, Cheshire, entrance adults 10p, juniors 5p. At least 10 working layouts in N, OO, and HO, plus steam locos, trade stands, refreshments, etc.



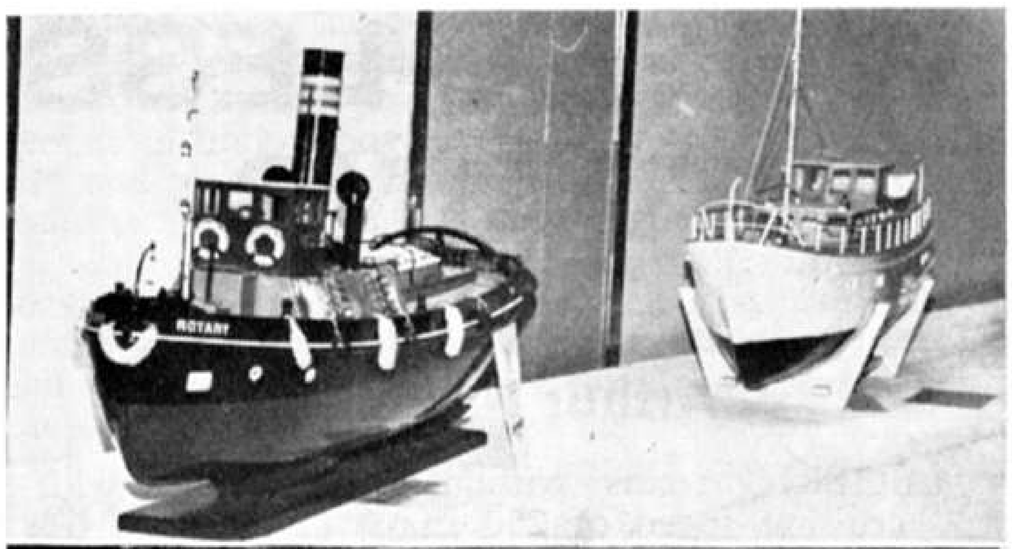
Above, part of the Meccano/Dinky display at Brighton Toy Fair. Right, models featured on the Aquarius TV programme included H. Smith's scale piano (which plays), Colin Tyler's steam ploughing engine, and Bill Carter's superb Atlantic locomotive. Electric aircraft were also demonstrated.



1972 Model Engineer Exhibition

THIS year's Model Engineer Exhibition was the 41st—the first was actually held in 1907 but with gaps for wars etc., there has not been a completely unbroken run. Some of the very fine models on show there are illustrated on these pages. The pictures above, for example, show a 6 bolt Admiralty Pattern Diver's Helmet hand-made by W. C. Holbind and an excellent model of a period building, the old "Crown" at Deritend, Birmingham, built by T. Clews. The picture below shows part of the Exhibition at one of its less busy times; the people up on the balcony are watching a flying demonstration on the 50 foot circle built across the hall at balcony level where up to four electric aircraft were flown simultaneously. The remaining picture on this page shows a Massey Ferguson 165 Tractor model by A. J. Sandfast, powered by a lawn-mower engine; this model was shown on "Blue Peter," during the Exhibition, and caused immense interest.

On the opposite page, working from left to right and downward, is a model of the tug *Rotary* which won a Championship Cup, with *Cynette* behind; a 15th century Military Crossbow by P. H. Reed; one of the many boats demonstrated on the indoor swimming pool; a Torpedo Boat Destroyer by Capt. R. E. Gardiner; Lord Gretton's 15 foot long *Royal Scot;* Napoleon's State Barge by E. Heriz-Smith; a Romany Caravan and Horses by W. H. Heather; some superb $\frac{1}{4}$ in. scale furniture by J. A. Adams which even included scale copies of magazines the size of a postage stamp; a splendid galloping horse roundabout by J. Maundrell; the Upper Ohio Steam Packet Steam Wheel Paddler by S.R. Coventry. These are only a very few of the hundreds of models on show.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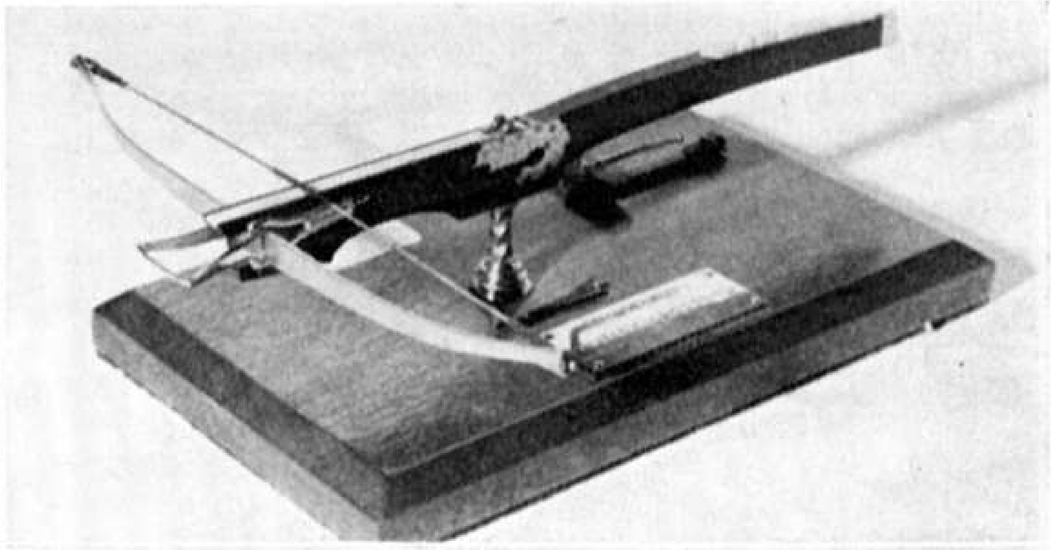

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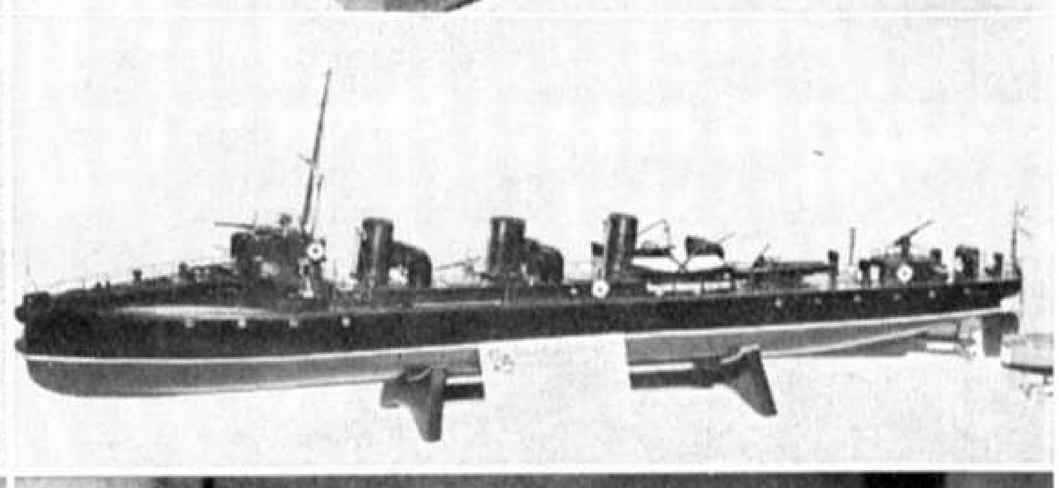

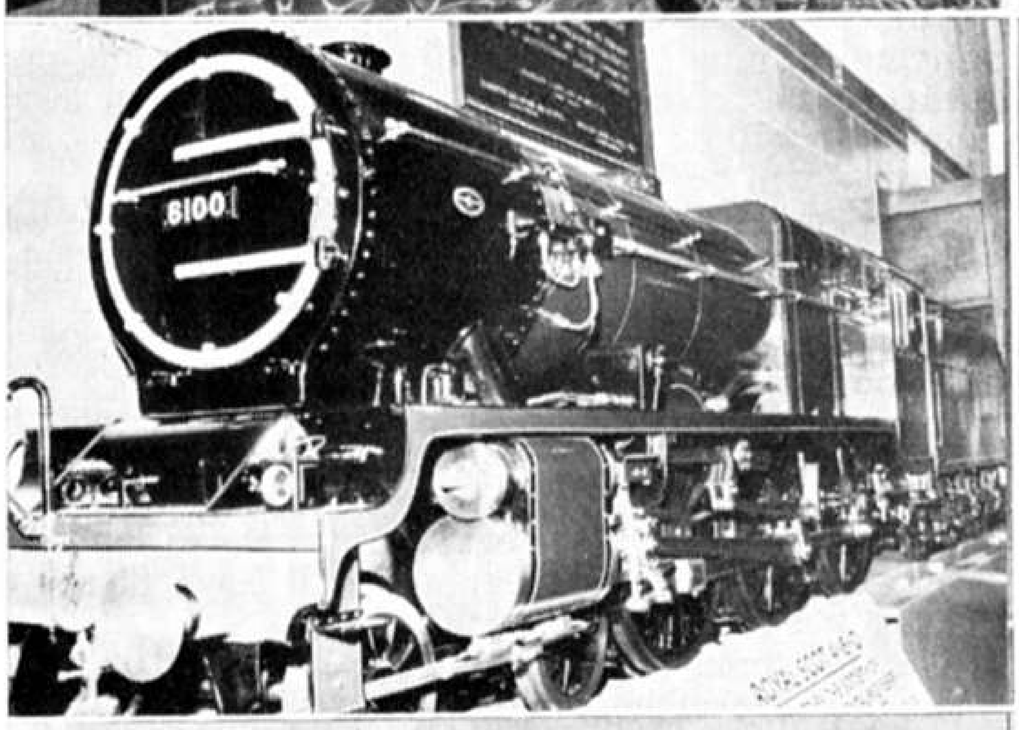
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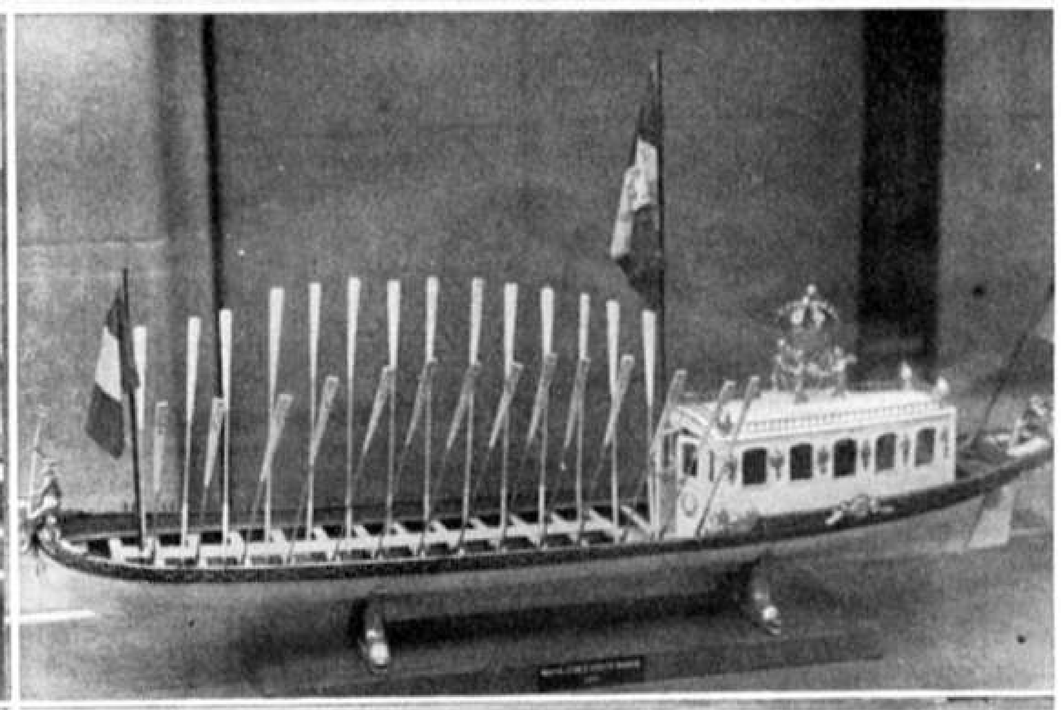

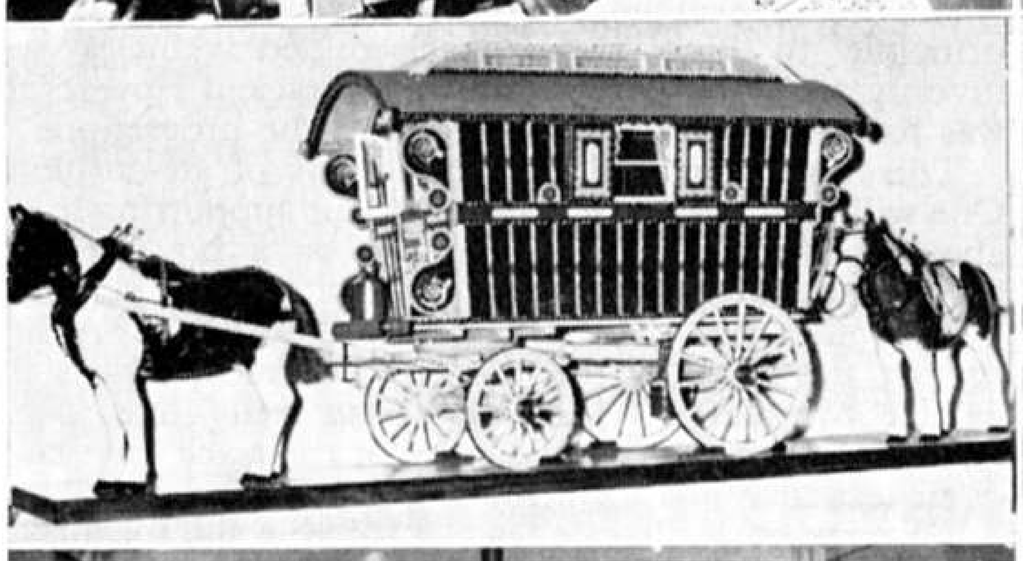

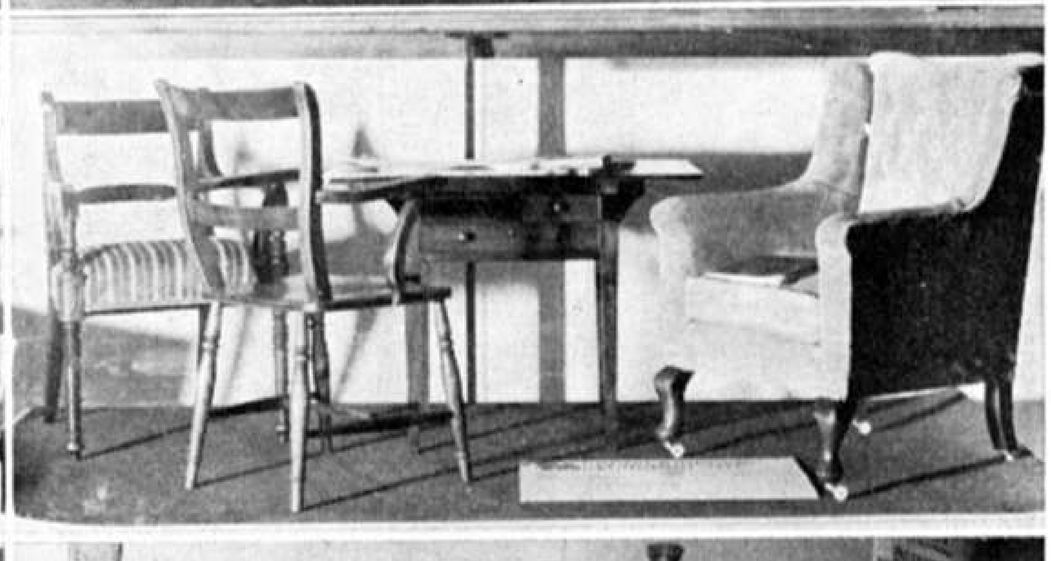

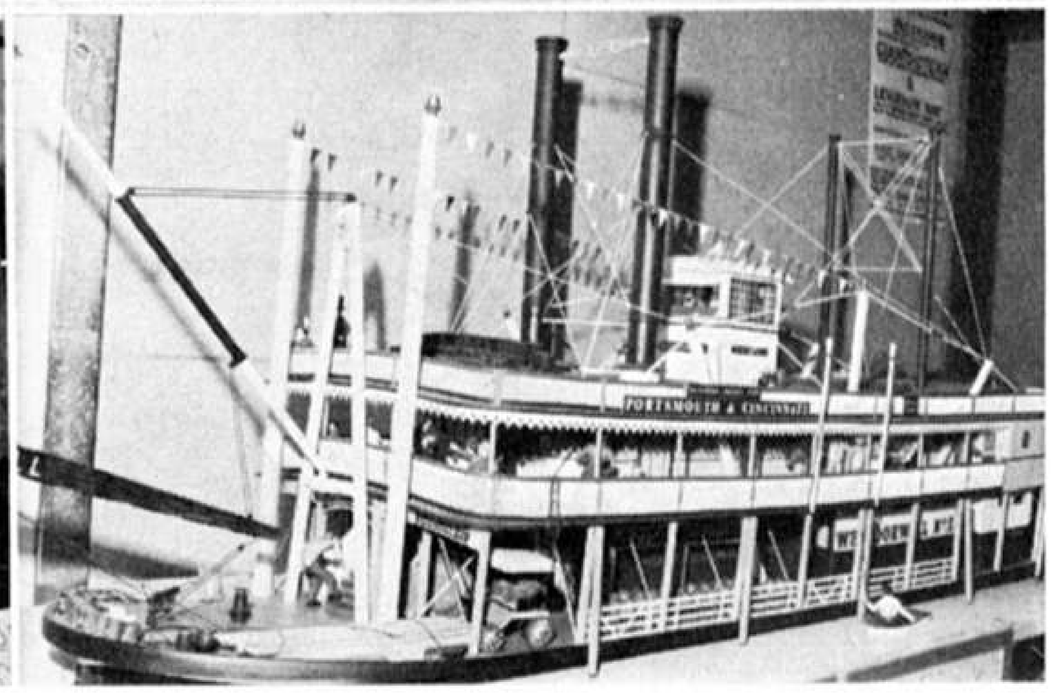
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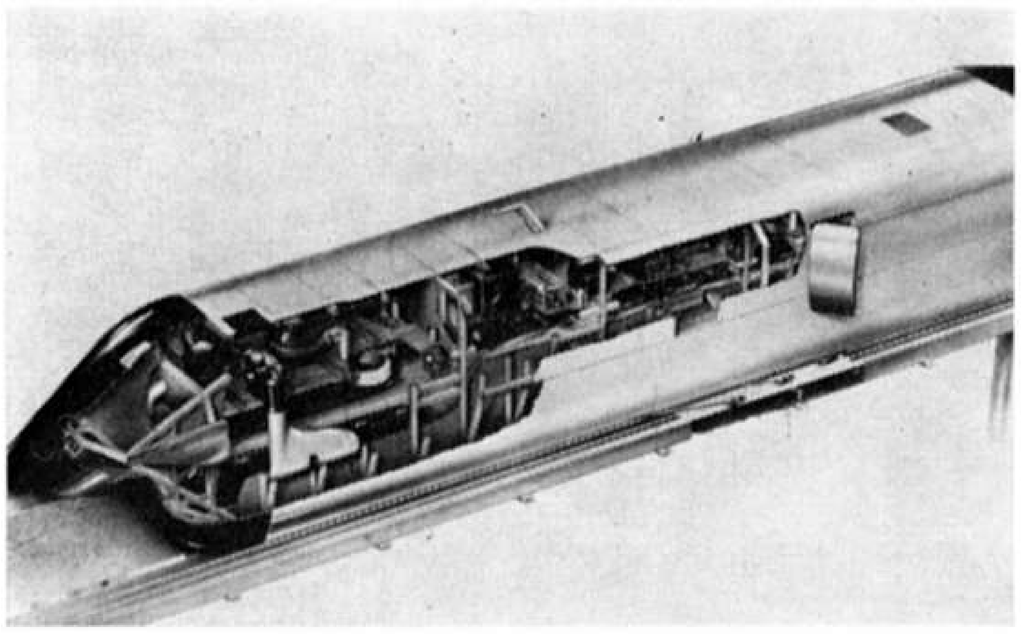
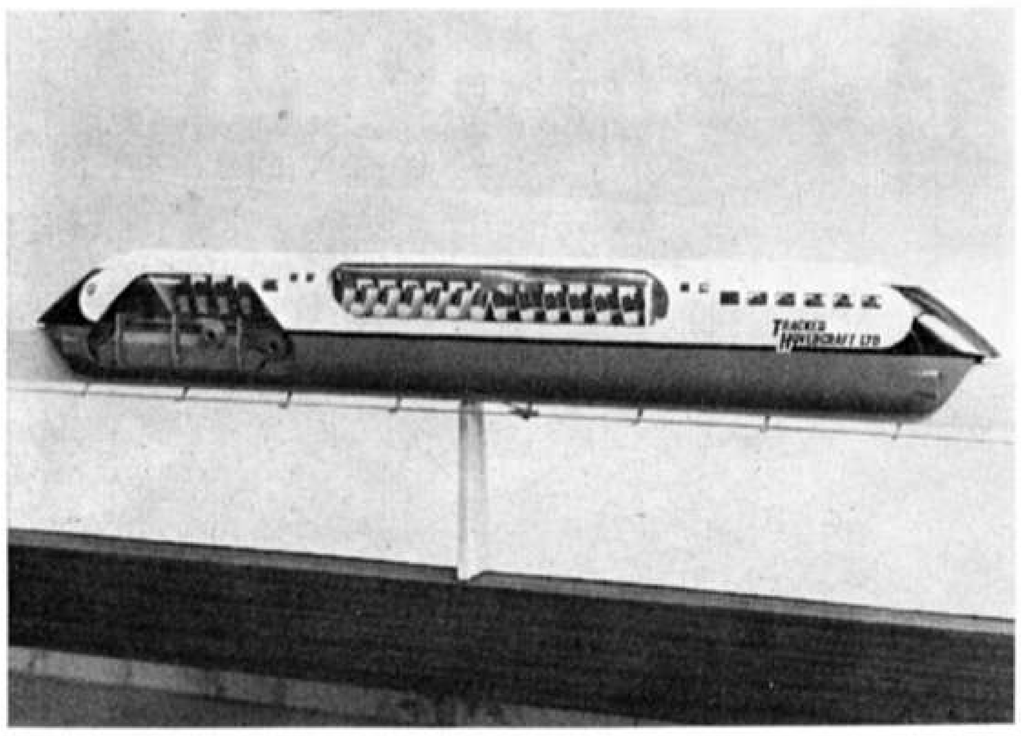
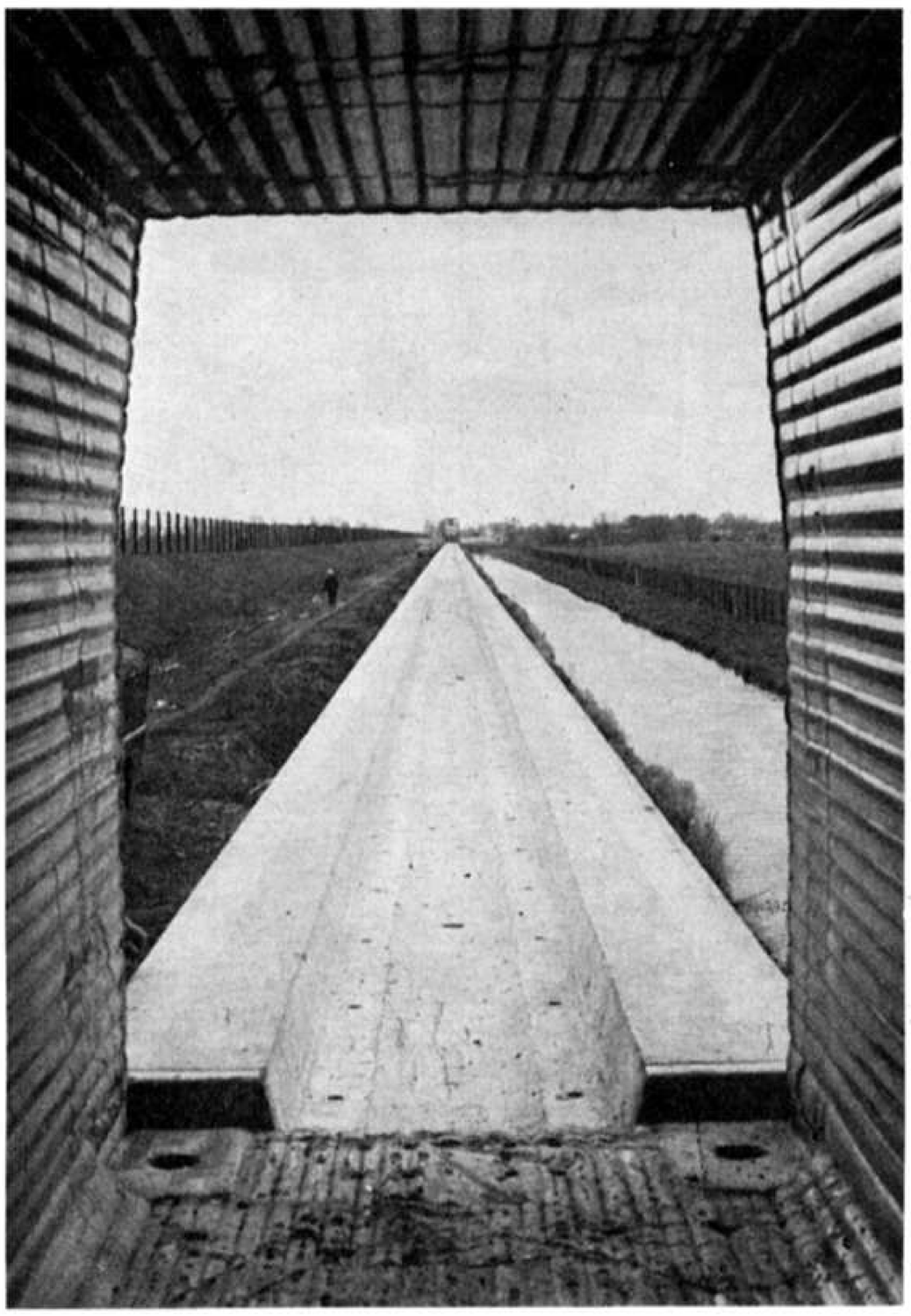






WHEEL-LESS TRAINS

by

Arthur Nettleton

ELECTRIC trains without wheels, but with a cruising speed of 250 m.p.h.! It seems like a wild dream, yet it is expected soon to become a reality, thanks to the latest development of air-cushion transport.

That system, first demonstrated by hovercraft, is now being applied to railroads, and full-scale tests have been in progress since last summer on a special track in Cambridgeshire.

The hovertrain, in fact, is no longer just a fancy, and the day is dawning when London and other cities in the United Kingdom will be linked by such ultra-speedy transport.

The originators of this revolutionary system see it as bringing Birmingham within 20 minutes travelling-time of the capital. Newcastle will be barely an hour away, Edinburgh will be reached in less than 90 minutes, and Liverpool will be 45 minutes journey distant.

Other routes likely to be catered for in the same way include London-Bristol, London-Nottingham-Sheffield-Leeds-Glasgow. Equally important, hovertrains are envisaged as a means of taking passengers quickly to and from airports.

It is anticipated that by the early 1980s it will be quicker to travel from city to city in Britain by hovertrain than by aircraft. And hovertrains will enable a return journey to be made between two places anywhere in the country within a day and still leave plenty of time to keep an appointment.

The development of the hovertrain started in 1960, when the idea of adapting the hovercraft air-cushion principle to high speed track-guided vehicles was investigated. In 1967 a company, Tracked Hovercraft, was formed to continue and expand the programme.

The hovertrain will have three sets of air-cushions. One will be the layer of pressurised air supporting it just above the track, in the same way as a hovercraft is suspended above the water.

The other two will be "guidance" cushions pressing against the sides of the box-shaped track, which the vehicle overhangs. Thus the train will glide along, separated from the top and sides of the track by a layer of air less than one inch thick.

To carry out full-scale tests, a suitable site for a track was sought, and after studying more than 200 miles of disused railway line which might have served, a site owned by the Great Ouse River Authority was chosen. North of Cambridge, and near the village of Earith, it runs north-east in the direction of the Wash.

Two rivers run parallel for nearly 20 miles across the Fen Country in this area, and the test track is alongside the barrier bank. To minimise the disturbance to wildlife, there has been collaboration with the Nature Conservancy and other naturalist bodies.

Top, an illustration of one of the experimental tracked air cushion vehicles.
Centre, this model "hovertrain" (with cut-away sections to show the interior and passenger seating arrangements) is of the type proposed for an airport/city link between central London and the third London airport.
Bottom, a view from inside one of the test track reinforced concrete "box" beam sections.

Starting as a three-mile track, and eventually increasing to seventeen miles, this first line is a trial route for two full-scale research test vehicles. The track consists of hollow-box-type concrete beams, each 75ft. long and weighing 50 tons, but a commercial system would use 150 ft. beams.

Trundling the smaller ones along the Cambridgeshire lanes has presented problems, but the construction team have introduced a method of track-laying in which each new section is slid out over the previous one. The completed structure takes the form of a neat concrete viaduct, normally about ten feet high but rising to 18 ft. where it crosses roads.

Propulsion of the vehicles will be by linear motors, and these will take their electric power from line-side contacts.

The linear motor is one of the most recent marvels of the electrical world, for it has no moving parts. It can best be understood by looking inside a vacuum cleaner, which has a motor with an outside part which keeps still (the stator) and inside part which spins round (the rotor).

The linear motor is really the same, but the rotor keeps still inside the vehicle while the stator "unwinds" along a continuous metal strip on the track.

Switch on, and the rotor shoots forward instead of spinning, drawing the vehicle along the track. Reverse the current, and you have a highly effective brake.

For hovertrain test purposes a model vehicle fitted with one of these ingenious motors was put through its paces successfully on 300 ft. of special track at Fen Ditton in 1970. The motor used there was the first single-sided linear induction motor in the world, representing a major breakthrough in the search for a silent, pollution-free source of propulsion.

The vehicles built for full-scale tests on the track at Earith are fitted with highly sophisticated instruments, similar to the system used in the Concorde development programme. A stream of information is transmitted from the research vehicles to the Earith base by a narrow beam UHF radio link at a rate of nearly two million "bits" each second.

This data is fed on to magnetic tape and then goes directly into a computer for immediate processing, so that the hovertrain engineers can get the results of the trial runs in the shortest possible time.

Also being used is a unique full-size dynamic "heave table", which under hydraulic control can be made to simulate all the relative movements of track to vehicle. It is the only facility of its kind available anywhere in the world, and is saving valuable time in exploring the possibilities of different hoverpad and suspension design.

The hovertrains expected to be speeding across Britain in about ten years' time will consist of 100-seater streamlined coaches, and they will obviate waiting or fitting your timetable to the railway schedule. They could leave every few minutes, because a train leaving London for (say) Edinburgh could reach its destination in time to begin the return trip less than two hours later.

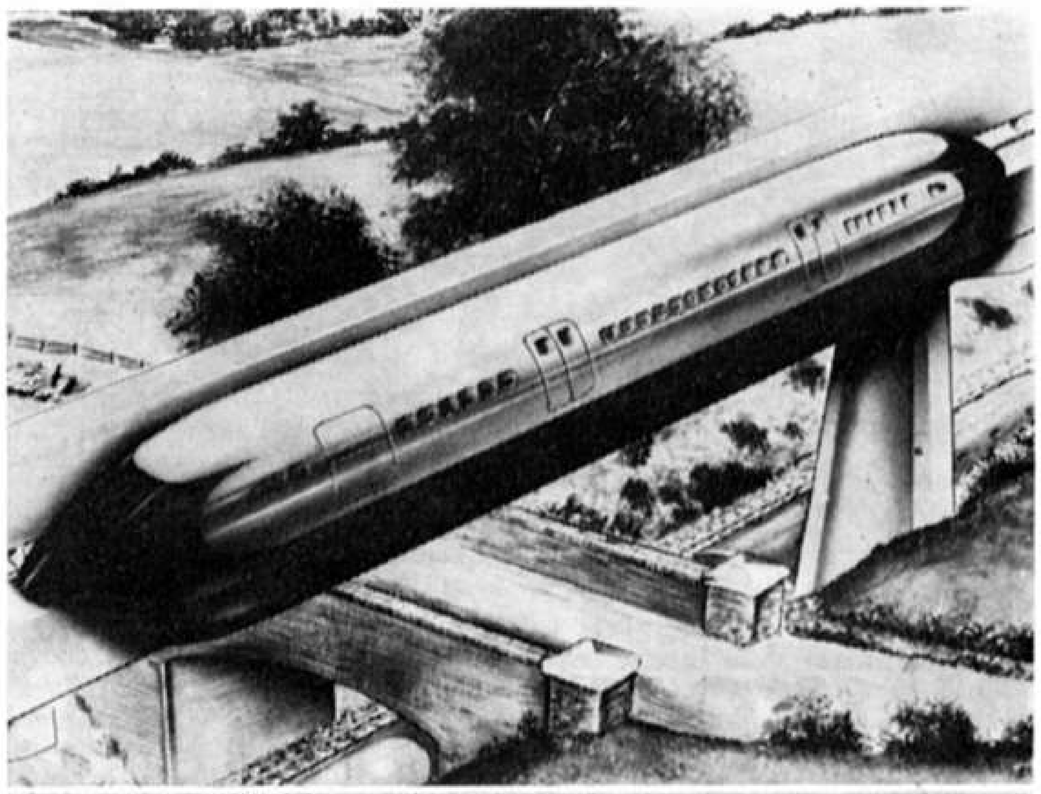
Ten-minute services are considered possible when Britain is provided with a general network of hovertrain routes. Another interesting point is that no sleeping berths would be required, as it would be unnecessary to operate night passenger services. At night-time the routes could be used for fast freight services.

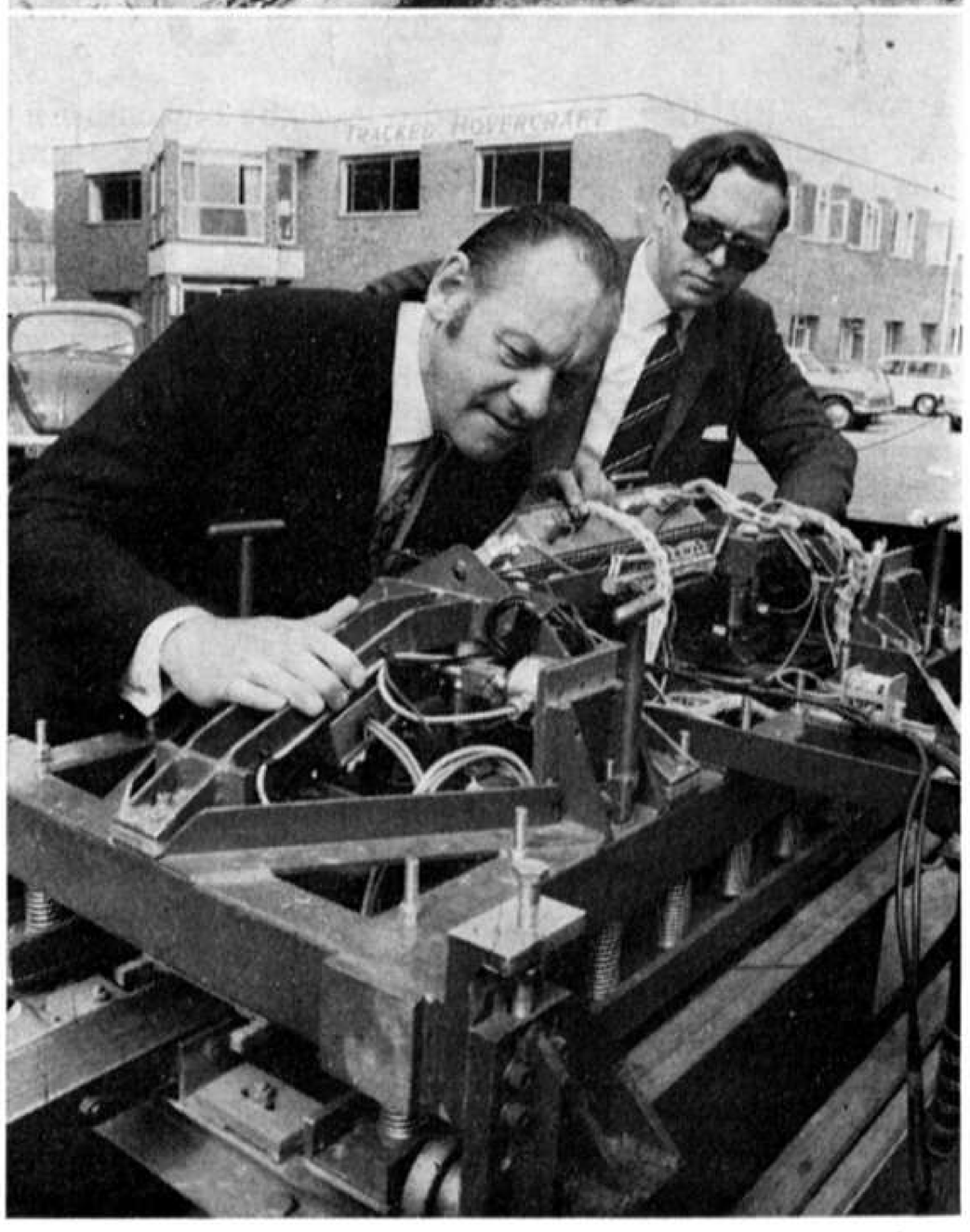
Britain is not the only country interested in this new form of transport. America has begun a research programme to find out whether it can be helpful in introducing better ground transport in the U.S., and has agreed to exchange views on the subject with British experts.

Germany, too, is investigating the possibility of developing hovertrain services, though these would be for freight rather than for passengers.

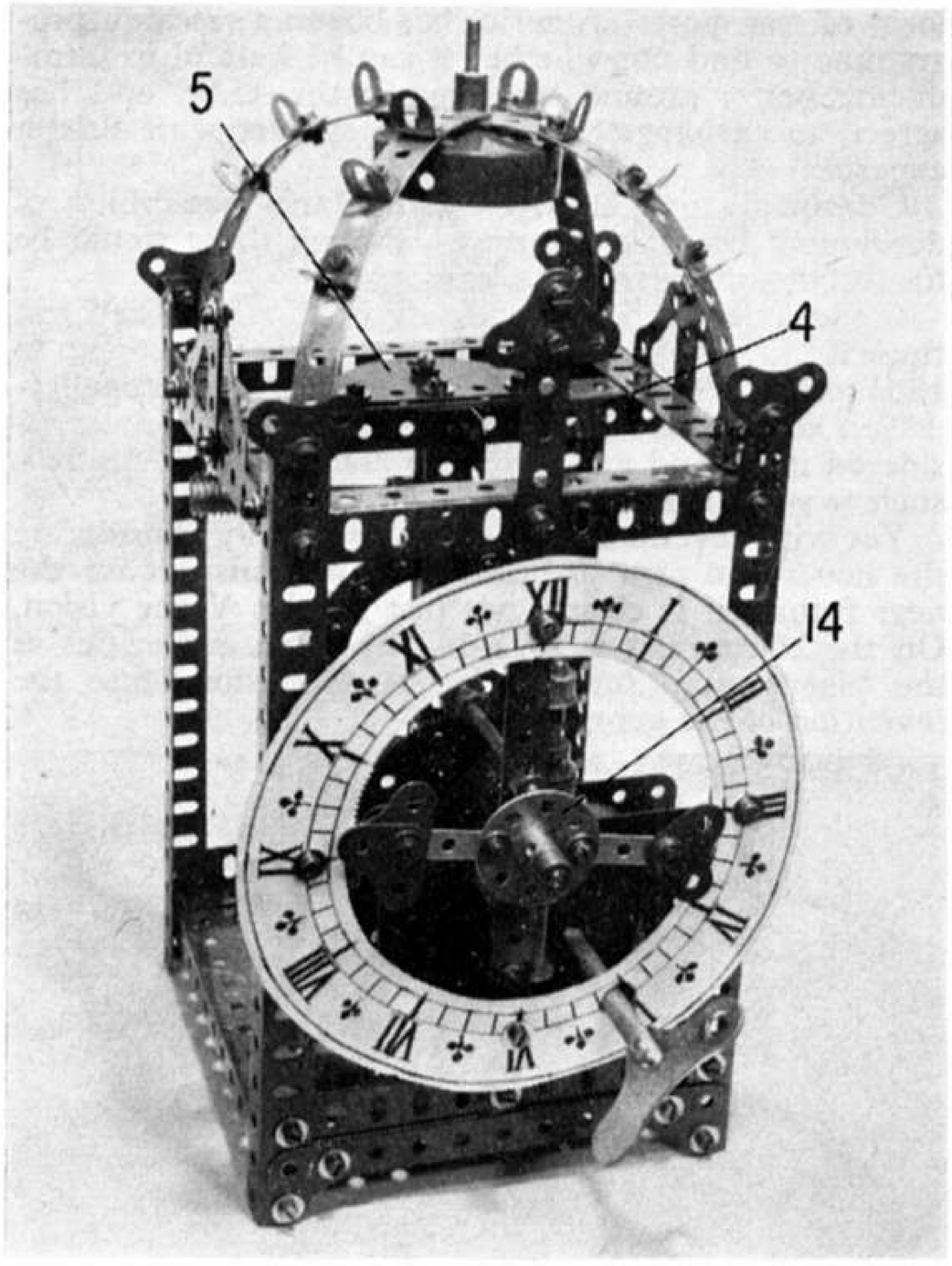
French engineers have already built a full-sized test track for hovertrains and have run them at speeds up to 180 m.p.h. The vehicles, however, are propeller-driven and do not use a linear motor. They are considered noisy and are more vulnerable to bad weather, such as snow and ice.

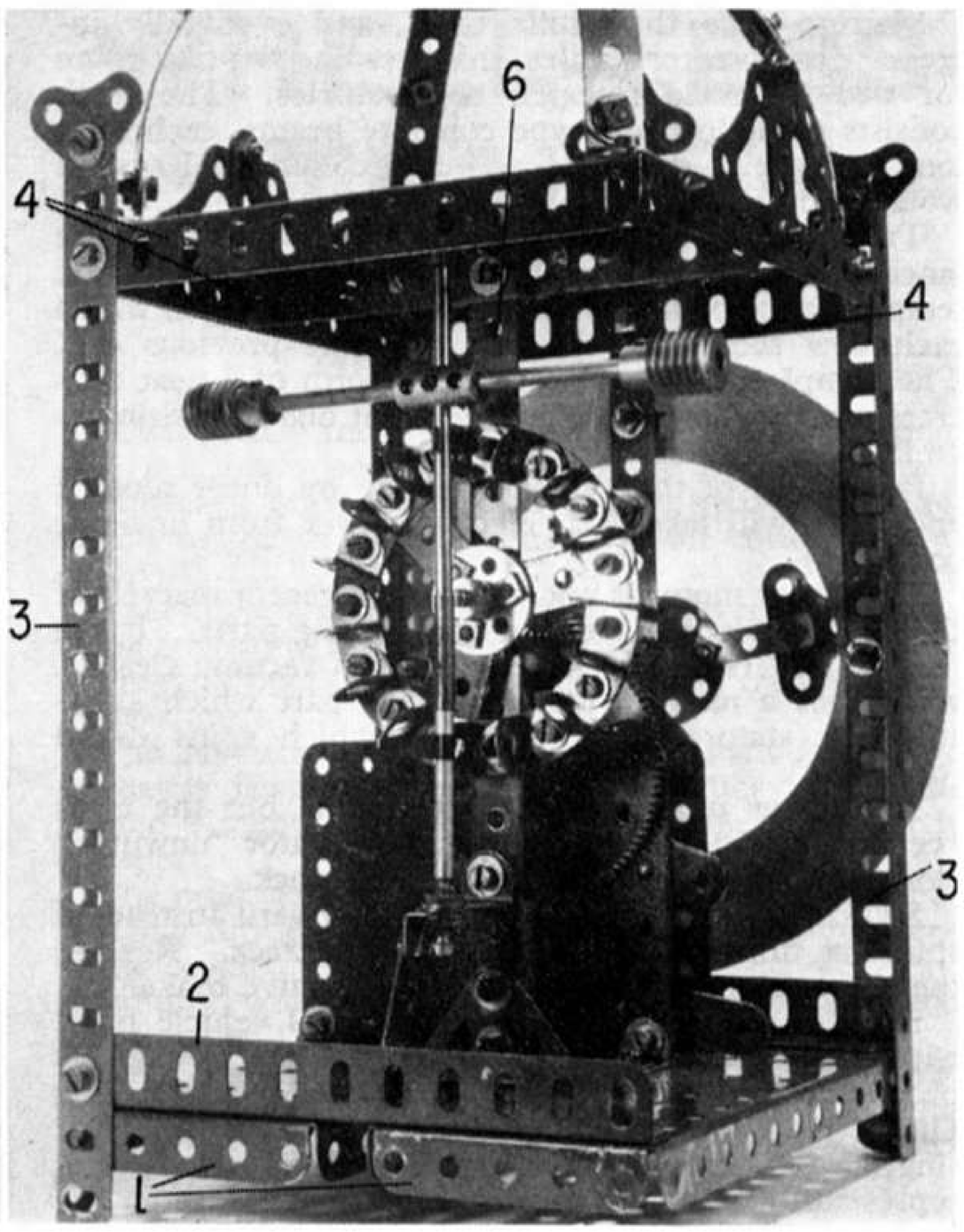
Yet with several countries now seriously considering the hovertrain as a practical form of transport for the near future, it is clearly not just a Jules Verne vision. On the contrary it is regarded by some authorities as the biggest step forward in transportation since the invention of the aeroplane.





Top, an artist's impression of how a tracked hovercraft system might look passing through a rural area.
Bottom, Prof. Eric Laithwaite (left) inspecting the single-sided motor test rig and track with Mr. M. Charity (right), THL Technical Manager.





Nuremburg Clock

An historical timepiece built in Meccano by Pat Briggs

ANOTHER first by one of our regular clock makers! Established readers need no introduction to Pat Briggs and his fine Meccano clocks which have appeared in various Meccano publications. This time he pulls off another 'first' by building an historical clock complete with a fully working replica, all in standard parts, of the original Nuremburg 16th Century clock Foliot, Verge and Crownwheel escapement. As usual with Pat's clocks, this one is simple to build, reliable and long running.

In the days of its forebears, clocks of this nature were almost invariably weight-driven as the art of the spring-maker was expensive and still in the process of development. However, the standard Meccano No. 1 Clockwork Motor, which features in many of Pat's clocks, is once again pressed into service with very pleasing results. In fact, the whole mechanism is literally and metaphorically based on the Motor, the remnants of the clock frame being almost superfluous!

Fig. 1. shows the general view of the Nuremburg Clock which reveals its basic simplicity. Generally speaking, our ancestors were quite happy to know the passing of the hour, hence the provision of the hour hand movement only. (Readers who might insist on a minute hand can add their own by using a 12:1 reduction gearing as standard practice). Since it was Pat's intention to reproduce the original in form and movement, the simple form is described here, Bert Love providing the pictures and write-up based on Pat's notes. The clock dial was made very quickly from a ring of white cardboard which was inscribed with a common felt-tipped pen. A winding hole of about $\frac{1}{4}$ in. diameter is provided on the 'quarter' ring at about the 5 o'clock position.

Construction of the clock case could hardly be simpler, consisting of just two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plates 1 joined by a pair of $5\frac{1}{2}$ in. Angle Girders 2, with four $9\frac{1}{2}$ in. Angle Girders 3 serving as corner posts. Even when one of the latter is removed, as in Fig. 2, to show the escapement, the clock still stands and functions perfectly. Five $5\frac{1}{2}$ in. Angle Girders 4 complete the top of the clock case, four of them in a square with the fifth one bolted across the square top by its end slotted holes, five holes in from the rear of the clock frame. This cross-member carried a $2\frac{1}{2}$ in. Semi-circular Plate 5 at its centre, the curvature to the rear holding an electrical Pivot Bolt by two lock-nuts to form the upper journal for the foliot shaft (See Fig. 1). A $7\frac{1}{2}$ in. Angle Girder 6 is attached centrally to the $5\frac{1}{2}$ in. Angle Girder and runs down to the base of the clock where it is secured in a Trunnion straddling the gap between the two Flanged Plates forming the base (see Figs 2 and 3). The Trunnion is raised by Washers, or suitable packing, to permit the escape wheel shaft $\frac{1}{2}$ in. Pinion 7 to mesh comfortably with the $2\frac{1}{2}$ in. Gear Wheel 8 mounted directly on the Motor drive spindle.

A pedestal bearing for the lower end of the foliot shaft is shown in Fig. 3 and is constructed from a $1 \times \frac{1}{2}$ in. Angle Bracket mounted

four holes up from the bottom of Angle Girder 6, but spaced from the Girder by three or four Washers on the fixing $\frac{3}{8}$ in. Bolt. A second electrical Pivot Bolt is set in the slotted hole of the Angle Bracket, at the same time securing a $\frac{1}{2}$ in. × $\frac{1}{2}$ in. Angle Bracket on the Pivot Bolt with the two locking nuts being *finger tight*, only. The spare lug of the $\frac{1}{2}$ in. Angle Bracket is then connected to the base of the clock by means of a $1\frac{1}{2}$ in. Perforated Strip 9 and a second $\frac{1}{2}$ in. Angle Bracket, as shown.

Fitting the Basic Gearing

In fitting the basic gearing, a $1\frac{1}{2}$ in. Corner Bracket 10 is secured to the top right-hand corner of the Clockwork Motor, as shown in Fig. 3, using two Nuts and Bolts and leaving the Nuts set square in line. The normal motor output shaft is replaced by a $2\frac{1}{2}$ in. Rod, the $2\frac{1}{2}$ in. Gear Wheel 8 being mounted on this Rod at the rear, with a Worm 11 on the Rod at the front. The Motor is then secured on the base plates with four $\frac{1}{2}$ in. Angle Brackets.

A $9\frac{1}{2}$ in. Strip 12 is now attached centrally to the front of the clock frame and lined up to match with the top hole of Corner Bracket 10 on the Motor, after which the hour-hand shaft is passed through. This shaft is a 3 in. Axle Rod which passes through the eighth hole up of the $9\frac{1}{2}$ in. Strip. It carries a Collar and a 19-teeth Pinion 13, as shown in Fig. 3. The hour hand itself is made from a $3\frac{1}{2}$ in. Narrow Strip bolted to a Bush Wheel 14 which is free to revolve on the shaft, being held in place by a frontal Collar against which the Bush Wheel is kept in fairly tight contact by a Compression Spring behind it. This arrangement keeps the hour hand rotating with the clock movement, but allows it to be set to the correct time when starting the clock. Two 1 in. Corner Brackets make a pointer for the hour hand and a third Corner Bracket forms the tail, the latter being counterbalanced by four Washers on a $\frac{3}{8}$ in. Bolt.

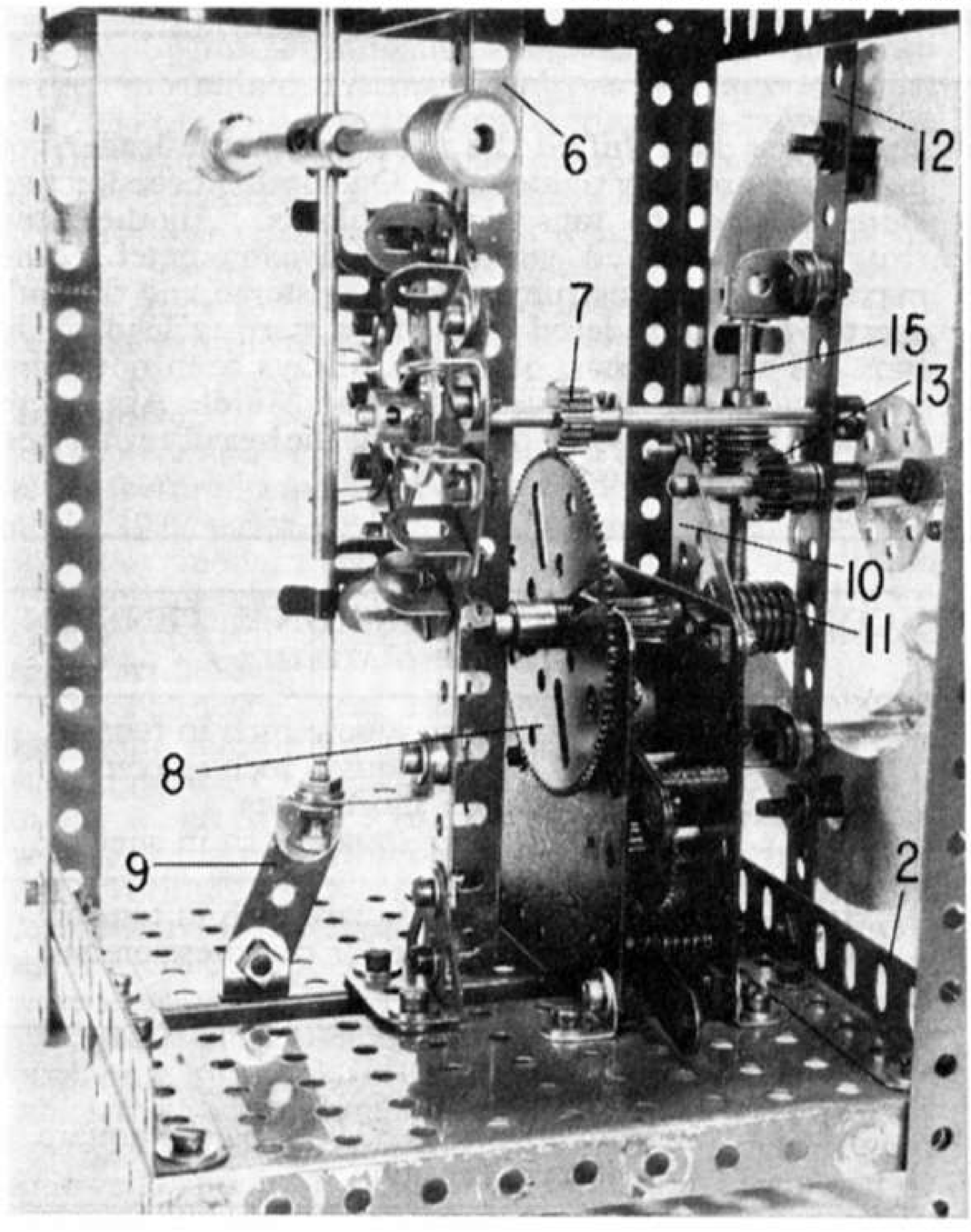
Drive to the hour-hand shaft is via Worm and Pinion reduction on a vertical 4 in. Axle Rod 15, this rod journalled in a pair of Corner Angle Brackets stood off from Strip 12 by three Washers on $\frac{3}{4}$ in. Bolts. Extra backing-up Washers are used to hold the slotted holes of the Corner Angle Brackets securely. The Rod is held in place by a Collar and a Spring Clip at the top end and the lower 19-teeth Pinion (not shown in the illustration) is set to mesh with Worm 11 on the Motor Shaft.

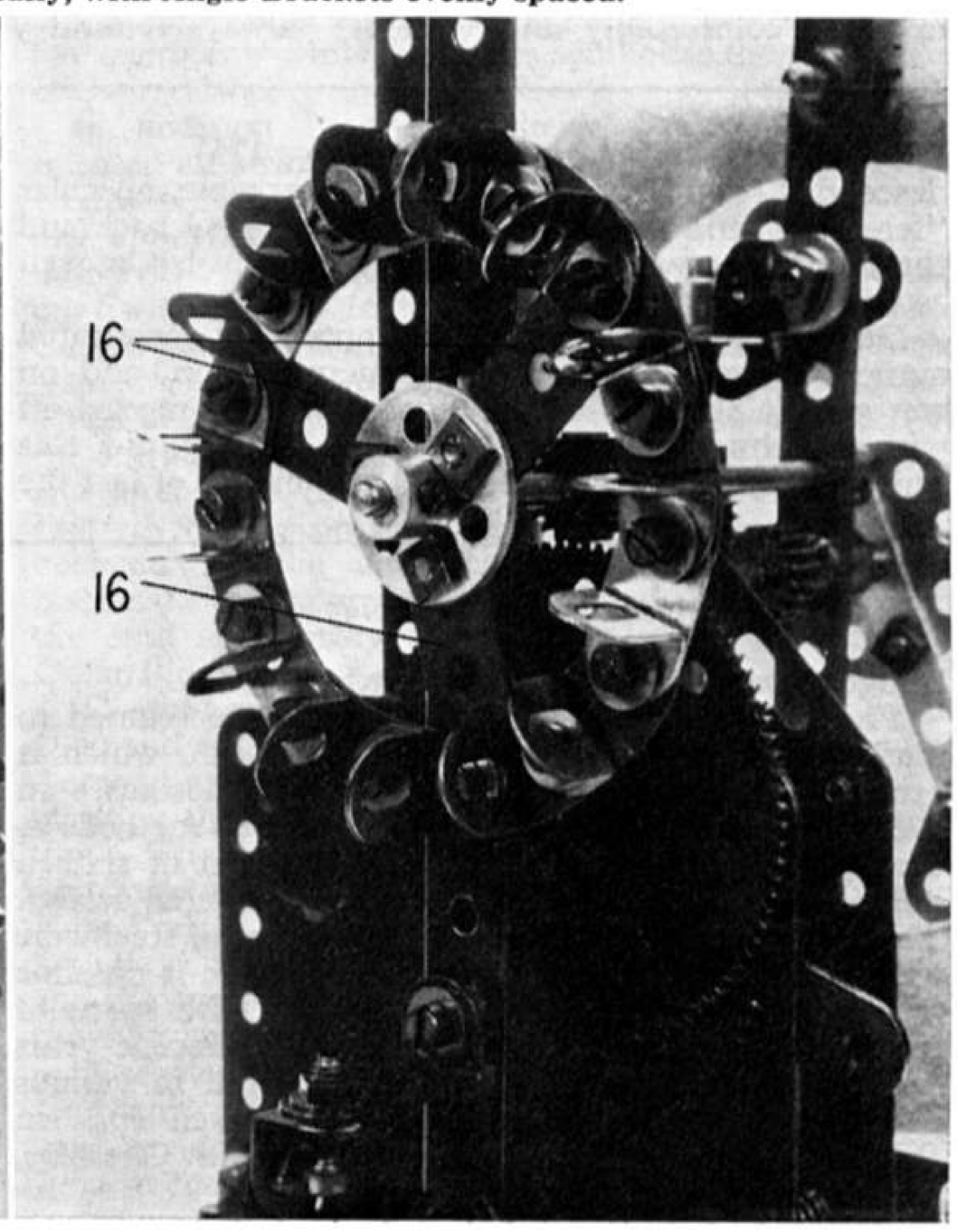
Building the Escape Wheel

The most critical part of the assembly is the escape wheel, and care must be taken with its construction. Verge escapements demand an odd number of teeth in the escapement, or 'crown' wheel, so this has to be a made-up job. Fig. 4 shows the unit in detail.

Three $2\frac{1}{2}$ in. Stepped Curved Strips are joined in a 'circle' by using three Fishplates. At the same time $\frac{1}{2}$ in. Angle Brackets are bolted to every available hole in the ring and three $1\frac{1}{2}$ in. Strips 16 are attached to the centre holes of the three Curved Strips to form the wheel spokes. These are then bolted to a 1 in. electrical Bush Wheel. Choose your parts carefully for this part of the clock; they do not need to be brand new but they do need to be in good condition. Be patient in setting up this escape wheel and make sure of the following points as far as possible: (1) that the crown wheel

(Opposite page Left) Fig. 1. A general view of the Nuremburg Clock, built in Meccano by Pat Briggs. No minute hands were provided on these comparatively simple units. (Right) Fig. 2. The Foliot verge and crown wheel escapement of the historical Clock. An odd number of teeth on the escape wheel is essential. (Below left) Fig. 3. A general view of the simple mechanism of the Clock, grouped around the Meccano No. 1 Clockwork Motor. (Below right) Fig. 4. A close-up view of the escape wheel. This must run concentrically, with Angle Brackets evenly spaced.





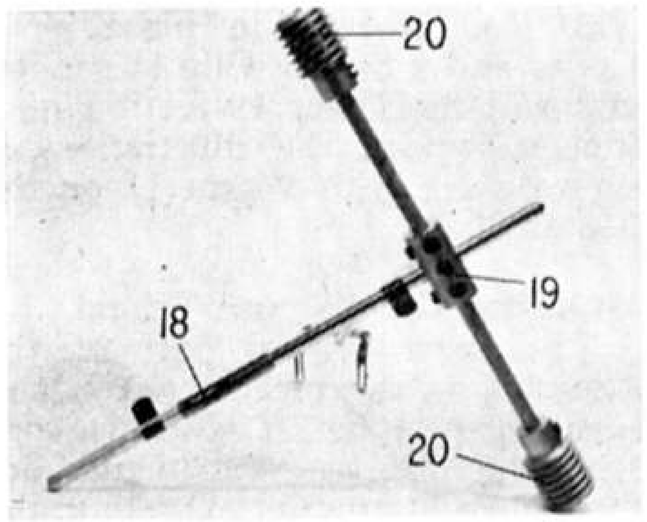


Fig. 5. The Foliot verge which makes use of the special Pivot Rods from the range of Meccano Electrical Parts Note the Spring Clips which engage with the Angle Brackets on the escape wheel.

does not wobble; (2) that it is as concentric as possible; (3) that all 15 Angle Brackets are set squarely in radial line with the shaft centre and that their tips stand off from the wheel rim at the same distance in each case. Thin Brass Washers from the Meccano Electrical Parts range are strongly recommended for setting up any discrepancies in levels in this, or any other part of the clock assembly. Remember that patience here pays handsome dividends!

When you are satisfied that it is running true, the completed escape wheel is mounted on a 4 in. Axle Rod which is passed through the central 7½ in. Angle Girder 6. The 19-teeth Pinion 7 is fixed on the shaft to mesh comfortably and without binding with 2½ in. Gear Wheel 8 on the Motor shaft. The shaft is held in place by Collars and Washers. At this stage a preliminary wind up of the Clockwork Motor should set the hour hand spinning and there will be no doubt about whether the escape wheel is running true!

Foliot Verge

Coming to the Foliot verge, this is simple by comparison with the escape wheel, as can be seen in Fig. 5, and it relies on electrical Pivot Rods for its success. A 3½ in. and a 2 in. Pivot Rod are joined by a Standard Rod Connector 18, a Coupling 19 being fixed towards the end of the longer Rod. A pair of 2½ in. Axle Rods, each fitted with a Worm 20, or similar weight bob, are fixed into the ends of the Coupling, then, finally a pair of Spring Clips are mounted on the composite pivot rod to align with the top and bottom of the escapement wheel.

It only remains now to set up the verge between the upper and lower Pivot Bolts and to screw them up gently, finally locking the Nuts when the escapement is working properly. Some adjustment of the Spring Clips will probably be required, both in height and rotation, until they are alternately caught and released by the escape wheel. The Foliot verge swings quite vigorously with a characteristic "thump, thump", so it will always remind you of its presence while it is working. This particular form of escapement, however, is notoriously less accurate than the pendulum and anchor escapement, so do not expect chronometer reliability! Nevertheless, the building of this clock is most instructive and results in a very acceptable form of antiquity!

Ornamentation

Clock ornamentation is purely a matter of constructor's choice. Fig. 1 shows the simple embellishments adopted by Pat Briggs, using four 5½ in. Perforated Strips, twelve Angle Brackets, a Boiler End, an Adaptor for Screwed Rod and some Corner Brackets. The result is extremely pleasing, but each individual builder is of course at perfect liberty to follow his own inclinations.

PARTS REQUIRED
BASIC CLOCK

1—1a	1—12b	52—37a	1—126
4—2	2—15b	40—37b	1—133
4—6a	4—16a	40—38	3—133a
4—8a	1—24	1—63	1—120b
1—8b	3—26	3—90a	2—154a
7—9	1—27c	4—111	1—213
3—10	4—32	3—111c	1—214
21—12	6—35	1—120b	1—235b

Electrical Parts

2—545	1—548	1—549	12—561

1 No. 1 Clockwork Motor

SIMPLE ORNAMENTATION

4—2	16—12	8—133a	1—173a
30—37	4—108	1—162a	

HORSE-POWER (*continued from page* 175)

descended from Shires. With his remarkable muscular "forearms" and quarters, short, well-coupled back and the immense power in his frame, the Shire has moved astonishing weights.

During official trials before a properly-constituted authority, two Shires, yoked tandem-fashion, and on wet granite setts (offering a poor foothold), moved off with the huge weight of 18½ tons. They did this quietly and without any fuss, and as a matter of fact the shaft horse had shifted the mass before the leader got his chains properly tightened. On another occasion two shires moved 16½ tons of wood blocks. Another time two Shires pulled against a dynamometer. The maximum of the instrument was registered and the pull exerted was considered equal to a starting load of 50 tons. The Shire has, of course, always been noted for its strength, and its ancestors of the Middle Ages were the only horses capable of carrying the heavily armoured knights of the period.

BRIDGES (*continued from page* 177)

bridge, illustrating the design principles.

The building of Sydney Harbour bridge seemed to mark the return to favour of the steel arch, which is probably still the most elegant of all bridge designs. In 1931 the Bayonne bridge, built by the same methods as the Sydney bridge, was completed at a cost of sixteen million dollars between New Jersey and Staten Island. The arch span is 1,652 feet and 16,000 tons of steel were used in its construction. Engineers believe it possible that we may yet see steel arch bridges with spans of from two to three thousand feet, and in recent years large steel arch bridges have been erected in various parts of the world. The largest steel arch span in Britain is the Widnes-Runcorn bridge in Cheshire, finished in 1961, with a span of 1082 feet.

COMPARATIVE COMPRESSION & TENSION
STRENGTHS OF MATERIALS

Mild Steel	18,000 lbs per square inch in tension 15,000 lbs per square inch in compression in short struts 13,500 lbs per square inch in sheer
High Tension Steel	20,000 lbs per square inch in tension with an increase for compression and sheer
Nickel Silicon & other alloy Steels	from 24,000 to 30,000 lbs per square inch in tension

Stamps by James A. Mackay

New Swiss Stamps

Early each year Switzerland issues a set of four or more stamps with the general title of the Publicity Series. Instead of releasing sets of stamps for each topical event, as many other countries do, Switzerland is content to group noteworthy events together and commemorate them in one set. This year's Publicity Series was issued on February 17th and consists of four stamps printed in multicolour photogravure by the world-famous firm of Courvoisier.

The first motoring organisation in the country was founded in 1896 as the Touring Club of Switzerland and two years later the rival association, the Automobile Club of Switzerland, was formed. In order to spare philatelists from having to buy separate issues of stamps for each event the Swiss postal authorities have grouped the two clubs together and issued a 10 centimes stamp in their honour. The stamp, designed by Hans Rudolf of Lauterburg, features the badges of the motoring clubs, with a warning triangle and an adjustable spanner, to symbolise road safety and vehicle maintenance.

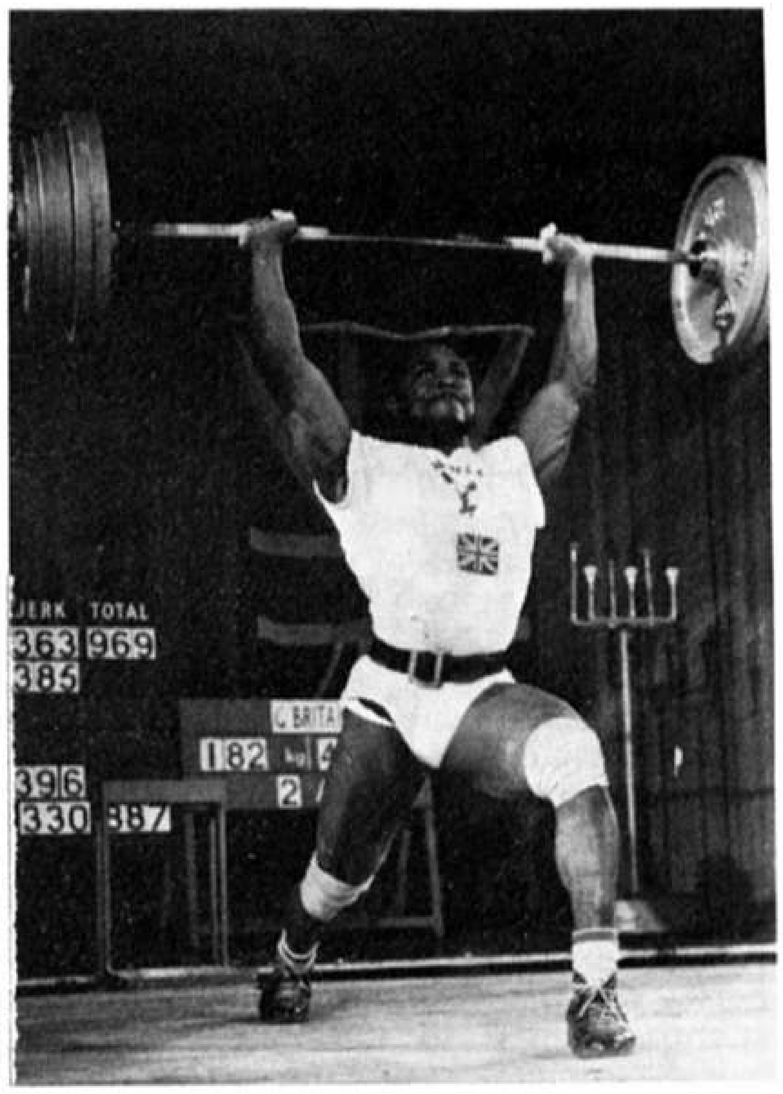
The 20c stamp celebrates the 125th anniversary of the first railways in Switzerland. The first line, the so-called Spanischbrotlibahn, connected Zurich with Baden in southern Germany and was opened on August 9th, 1847. This was the first section of a railway line linking Zurich to the German railway system at Waldshut, and thence to Basle. Within a few years the whole country was criss-crossed with a network of railways which, despite numerous technical and financial difficulties, grew to be one of the densest in Europe. The centenary of the Swiss railways was marked in 1947 by a set of four stamps depicting the "Limmat", the first locomotive, in contrast with a modern steam freight locomotive and an electric train. The top value of this series featured a modern railway bridge. The 20c stamp of the 1972 series, designed by Herbert Auchli of Berne, shows a modern switch table, indicating the rapid technical development of the Swiss railways and their efforts to keep abreast of their competitors in the transport field.

On February 14th, 1922 the municipal council of Lausanne authorised the city to erect a transmitting station on the Champ de l'Air (airfield) for the requirements of air traffic. In May of that year news and weather reports were broadcast over the transmitter for the first time. This service was continued until August 22nd when the first national transmitter of Switzerland—the third in Europe—began regular operations. Records were broadcast in the intervals between flights. These successful transmissions led to the foundation, at the beginning of 1923, of a broadcasting company from which the Société Romande de Radiodiffusion eventually emerged. Other regional broadcasting services soon followed, and in February 1931 they amalgamated to form the Swiss Broadcasting Corporation, which today controls television as well as sound radio. In 1923 there were 980 radio licences; today the number is approaching the two million mark. The 30c stamp, by Roland Hirter of Berne, shows the propagation of sound waves over a human face, symbolising the close contact between the listener and the broadcasting service.

People of Swiss origin are now to be found in every part of the world. Since 1922 they have maintained contact with their native land by means of an annual congress. The fiftieth congress of Swiss citizens residing abroad is being held in August this year and the 40c stamp of the series pays tribute to their loyalty to their homeland. The stamp, designed by Celestino Piatti, shows a gnarled tree trunk from which grow five boughs sprouting 22 leaves. The boughs stand for the five continents while the leaves symbolise the 22 cantons of Switzerland.

In addition to the Publicity Series Switzerland released an airmail stamp of 2 francs face value, with a 1 franc premium. The stamp depicts a Jumbo jet—the first appearance of the Boeing 747 on a stamp—and is inscribed PRO AERO. This inscription has appeared on Swiss stamps issued since 1938 for use on mail carried on special flights. The premiums from these stamps go to the Pro Aero Fund for the development of Swiss aviation. The first of these stamps consisted of the 50c air stamp of 1923 overprinted PRO AERO 1938 and surcharged 75c. The 1 fr stamp of 1941 was overprinted for use on mail carried on the special flights between Buoche and Payerne. One of the 1943 National Fête stamps was overprinted that year to mark the 30th anniversary of the flight across the Alps by Oscar Bider.

The first specially printed Pro Aero stamp appeared in 1946 and featured an instructional glider. Further Pro Aero stamps appeared in 1949 and 1963, the latter marking the 25th anniversary of the Pro Aero foundation. The new stamp marks the 25th anniversary of the first Swissair trans-Atlantic flight, between Geneva and New York. A stamp issued on that occasion showed a Douglas DC-4 between St. Peter's Cathedral in Geneva and the Statue of Liberty. The new stamp also marks the 50th anniversary of the first Swiss international airmail service, which linked Geneva and Nuremberg in Germany. This stamp can be used to prepay postage on mail carried on the special flights scheduled in May and June to commemorate these events.



WHAT'S YOUR HORSE-POWER?

BY E. R. YARHAM

THE amount of power wrapped up in the average body is astonishing. Recently an R.A.F. physiological research team carried out some experiments involving the receiving end of Henry Cooper's famed left-hand punch. They revealed: (a) the wise chap keeps out of its way; (b) it accelerates fifteen times as fast as a moon rocket; and (c) it lands with a force of three tons.

Something along the same lines revels in the name "Integrating Pneumotachograph". It is nothing so formidable as it sounds, and in reality is a harmless but valuable instrument developed by the British Medical Research Council. As its name is something of a jaw-cracker it is known for short as the I.M.P.—IMP.

Its role is to record the energy expended when an animal or person is wearing it and carrying out such activities as walking, running, climbing, or digging. In short it measures h.p.—horse-power. The instrument was designed to operate at extremes of temperature, and its toughest assignment so far was when it formed part of the scientific equipment used by Sir Vivian Fuchs on his Trans-Antarctic Expedition.

"Horse-power" is a commonly used term, a household word, but few realise its scientific implication. It is defined as the rate at which work is done when 33,000 lb. are raised one foot in one minute; or alternatively, any piece of mechanism which can work at the rate of one horse-power should be able to lift a weight of about one ton vertically upwards against gravity through fifteen feet in one minute. It was the famous Scottish engineer James Watt (1736–1819) who adopted this value as the result of experiments with strong cart horses, although he knew it was in excess of what could be done by the average horse over a full day's work.

The amount of horse-power a man expends in doing particular jobs has been increasingly studied, and the results have provided the basis for trade union claims in some instances. Dr. D. R. Willkie collected some statistics for the Man Powered Aircraft Committee of the College of Aeronautics. He assessed that a reasonably fit man can exert just a little under half h.p. for quite a long period, a half hour or more. For a very short period, one of a few seconds only, the power can be as much as two h.p., falling rapidly as the time is extended to four or five minutes, above which it is down to a little below half h.p., falling only slightly with an increase in time.

Some of the requirements for success in athletics were discussed at a British Medical Association symposium. Professor O. G. Edholm, of the Medical Research Council, said the energy output of weight lifters or pole vaulters was extremely high—up to two and a half h.p. for very short periods of time. This period accords pretty well with the estimate made by Dr. Willkie, but it is possible that champions exceed it. A short time back Louis Martin, the British and Olympic weight lifter, went to Loughborough University of Technology to have his h.p. measured. When he was full out the researchers found that he was exerting something like four h.p.

A good sprinter, dashing over 100 yards, is capable of getting up to about 20 m.p.h. Enormous energy is concentrated into that 10 second burst. That is an average time these days. The world record stands at 9.1 seconds. It has been clocked four times. A physiologist summed up the athlete's effort in this way: "He develops a horse-power almost equal to that of a small car."

A notable athletic record stands to the credit of a man who weighed only eight stones. He jumped one thousand hurdles, each 3 ft. 6 in. high, in 61½ minutes. In achieving this he lifted his own weight to a height of some 3,500 ft., and at the same time ran six miles.

The flat record for this distance is just under twenty-seven minutes.

Climbing is another activity which calls for great energy. For example, running upstairs. It a man runs up as fast as he can for four seconds he exerts one and one third h.p.; if he continues upwards for half a minute the effort maintained falls to slightly less than one h.p.; and if he keeps on climbing for three and three-quarter minutes his output falls to less than one half h.p.

On one occasion seventeen men took part in a race to the summit of Ben Nevis (4,406 ft.), the Scottish peak which is the highest mountain in the British Islands. The winner, Ewen McKenzie, did the climb in 1 hr. 8 min. 19 secs., and as he weighed 12 st. 6 lb. calculation shows that he was working at the rate of 11,000 foot pounds per minute, equal to one-third h.p., during the whole of the ascent.

All-out walking also demands a large output of energy. A walk of 58 miles, up hill and down dale for 22 hours was maintained at the expenditure of one-sixth h.p., and the pedestrian who did it was 50 years old. Only those who have done a postman's round know how exhausting even walking from door to door can be. In recent years extensive development of flats has entailed considerable extra climbing for postmen. Medical research tests have been made into the effect of stair-climbing on their work, and one outcome was that on such rounds postal employees have pressed for their loads to be reduced.

On one particular round a postman had to climb approximately 300 steps in all and, of course, descend them as well. This is almost as hard as going up, as I found when walking down the 500 ft. of the Washington Monument in the city of that name. A borough engineer reported that to climb four flights of stairs of 64 steps, a ten-stone man has to expend sufficient energy to raise 46 cwt. to the height of one foot.

In a rowing eight, taking 33,000 units of work per minute as the standard, it has been calculated that the amount of energy expended by an oarsman is about 7,500 units per minute. Thus a Varsity crew rowing in the Boat Race from Putney to Mortlake would together have an output of 60,000 units a minute. This is a little less than the output of a two h.p. engine, maintained over 4 m. 1f. 180 yds.

Hammer-swinging is a hobby where some outstanding figures have been set up. One man, Arthur Lancaster, swung an eight-pound blacksmith's hammer for twelve hours without a break. During that period the hammer head travelled 150 miles and the swinger lifted more than 150 tons to the height of one foot.

One of the toughest tests of a competitor's fitness and endurance is the six-day cycle race, long popular on the Continent and in the United States, and introduced into this country a few years back. During one such contest the exertion of the winner over the first 24 hours was found to be equal to lifting 20 million pounds to the height of one foot. To put it another way, it was equivalent to raising 34 cwt. to the height of one mile. This is some six times greater effort than is expended during a day's manual labour, and is reckoned to be about the limit possible to man over an extended period.

It is surprising how what would be regarded by outsiders as one of the simplest tasks calls in reality for considerable expenditure of effort. An interesting example comes from two villages in Suffolk, each of which has a church clock wound by the pulling up of weights. The rector and his son, who is an engineer, had the job of doing this. The latter calculated that in one case the winding called for just over one-eighth h.p. every six days; and in the other one-seventh h.p. every nine days. When these figures were made known to the parishioners they took pity on their parson and volunteers came forward to do the job.

A fairly accurate computation of a man's working h.p. was made in the Middle East, where simple methods of irrigation are used even now. Tilting buckets on swinging levers exactly counterbalanced by weights are employed for bringing up water from river beds or wells. Since the action in the process of elevating the full bucket and lowering for refill is comparatively simple, the job is one which lends itself to easy calculation of the work done at each cycle.

In this way it has been reckoned that the peasants employed on the task can keep up a rate of about one-twelfth h.p. for two, three or four spells a day, with rests between. At the end of the day no signs of undue fatigue are visible.

Another easily estimated form of work involved the erection of fortifications of stone and earth around Paris during the early part of last century. The buckets were attached to the same rope as the labourer, after passing over the pulley. When loaded the bucket was hoisted by the man lowering himself as a counterpoise. His job then consisted of climbing a ladder to regain his first position after each load was emptied. A h.p. almost identical with that for the Middle East peasant was arrived at for the French navvy.

At the outset of this article it was mentioned that James Watt based his calculations on h.p. on the work of which a heavy cart horse is capable. A typical breed is the Shire. Of the large number of working horses in London at one time, 950 out of every thousand were

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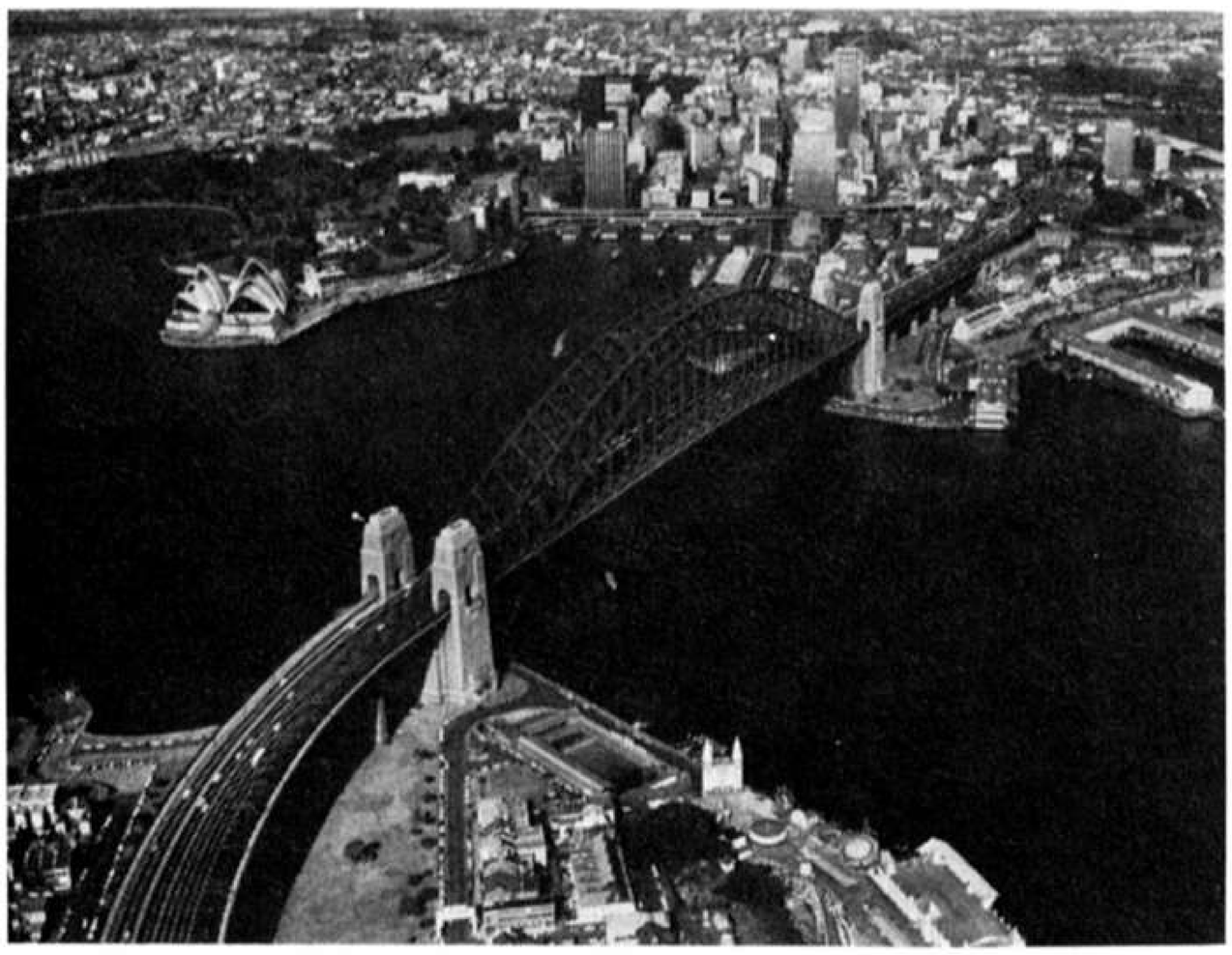
Heading photos, left, shire horses at work. Right, Louis Martin, the British and Olympic weight lifter. Right, John Winpenny, designer and first pilot of Puffin, man-powered aircraft.



THE DESIGN AND CONSTRUCTION OF BRIDGES

Part 3

THE STEEL ARCH

by T. Wise

STEEL was first used in the construction of bridges as early as 1829 in the building of the Danube Canal bridge in Vienna, but it was the establishment and growth of the railway industry, creating a demand for bridges in all parts of the world, that led to the rapid new developments in the designs of bridges. These new ideas on design, coupled with the mass production of steel, resulted in iron being abandoned as the prime material in bridge building.

The benefits brought by steel were countered by only two defects: steel is extremely susceptible to rust, making constant maintenance necessary, and it expands appreciably with rises in temperature. The latter is provided for by the inclusion of expansion joints in the designs, such as the hingeing of arch bridges, explained later in the article, the use of rollers at one end of a truss instead of a fixed bearing, and in modern suspension bridges the wire adapting itself to a new curve to allow for any such increase in length.

In 1867 the American engineer Captain James Eads began work on his bridge over the Mississippi at St. Louis, using for the first time an alloy steel in bridge construction. The bridge, completed seven years later, was the largest arch bridge of its day, with two side spans of 502 feet each and a central span of 520 feet. However, the first bridge to be built entirely of steel was that carrying the Chicago-Alton railway over the Missouri at Glasgow in South Dakota. It was not completed until 1878.

The French engineer A. G. Eiffel used wrought iron, mild and cast steel when he built the Viaduc du Viaur, carrying the railway from Carmaux to Rodez over the River Viaur in the Aveyron area of southern France. Completed in 1880, the viaduct was not of a new design but very few of its kind had been built at that time. The main advance was that scaffolding, or staging, could be done away with all together, a great advantage in this particular case where the height above river level is 380 feet. Known as equilibrated or balanced arches, the system entails building out from each side of the valley, in this case covering a span of 1180 feet, the viaduct having a total length of 1515 feet. The approaches are masonry, with independent trussed girders of the Pratt type connecting to the ends of the arch ribs. (The subject of trusses is covered in article number five in this series.) The arch ribs are 187 feet deep at the piers and have a span of 227 feet, diminishing to a depth of only 10 feet at the crown. The central span remaining is 726 feet, which if divided into two gives 363 plus 227 (length of side span) = 590 feet, so that each half of the bridge represents a kind of balance beam. Once the side spans have been erected with the arch ribs, the remainder of the bridge is completed by building outwards on the cantilever principle to a meeting in the centre. The breaking stresses of the materials were (per square inch) 30 tons for steel, 23 tons for wrought iron, 27 tons for the steel used in rivets and 26 tons for wrought iron rivets. Although this great viaduct is still in use the design was too fragile for modern needs. At this time also engineers became enamoured with the cantilever principle for bridging large spans—the Firth of Forth railway bridge was begun in 1822—and for some years the arch was neglected by bridge builders.

Meanwhile concrete, which had at this time already begun to replace timber, brick and stone for arch bridges—the first concrete bridge in Britain was built as early as 1877—was improved at the turn of the century by the introduction into it of high tensile steel rods, and this reinforced concrete began to replace steel for arch construction from about 1905.

Fig. 1 is an outline of the steel bridge that in a single majestic span of 500 feet leaps over a 400 foot chasm of

Above, Sydney, Australia. In the foreground are road and rail approaches to the Harbour Bridge, linking the northern suburbs with the inner city area.

FIG.1.

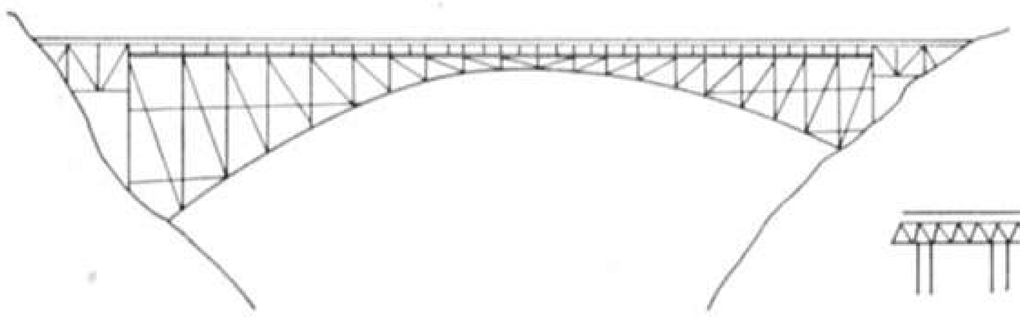
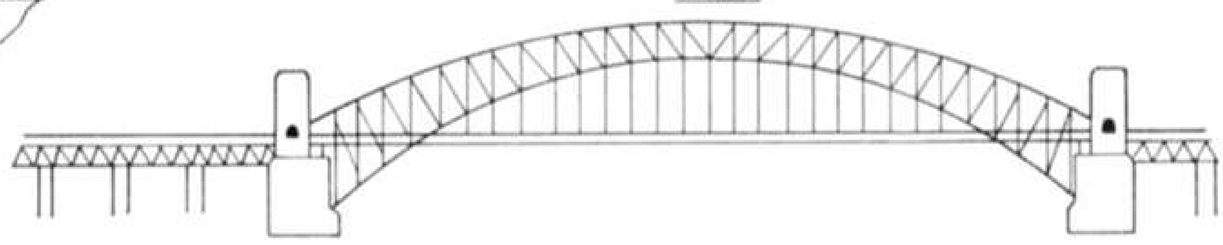


FIG.2.



the Zambesi River below Victoria Falls. Built in 1905, the Victoria Falls bridge carries a vital link in the African railways system. Only one side of the construction has been drawn in detail in order to illustrate the members more clearly.

The steel arch was not yet finished, indeed the greatest examples of it were yet to be built. In 1917 Gustav Lindenthal erected a great steel arch across the East River in New York. This bridge—the Hell Gate, carrying four railway tracks over a 977½ foot span—was the pioneer of the modern steel arch bridge. In its design Lindenthal utilised the arch and suspension principle employed by Brunel for the Royal Albert bridge at Saltash, the deck of the bridge being suspended from the arch itself, instead of being supported above it. In this tied or bowstring design the curved upper member of the bridge takes the character of a linear arch, transmitting a thrust throughout its entire length, while the lower member, forming the bridge deck, is simply a straight tie uniting the ends of the bow. Once construction is complete the whole structure can become independent of the abutments and merely rest on them in the same manner as a beam. In very large bridges the uppermost member may become a curved lattice girder consisting of two concentric members braced together, see sketch of Sydney Harbour bridge. In this case the arch thrust is divided between the two members, although it cannot always be shared equally by them.

The trouble with this design arises with the changes of temperature, for the expansion of the curved member forces it to bend upwards at the crown, since it cannot expand its length. Provision for such expansion is therefore made by the introduction of pins, or hinges, at certain spots. (Hence the terms unpinned and fixed, or two- or three-pinned bridges.)

In many cases the curved member is hinged or pinned at the skewbacks. This permits a freedom of angular movement at each abutment, enabling the member to take a continuous curvature in one direction throughout its length and so accomplish the bending promoted by expansion. The resulting stresses are much less severe than if the member were secured to the skewbacks. Stress is still experienced at the crown of the arch, however, and this can be eased sometimes by the use of a third pin or hinge at the crown. The Viaduc du Viaur employed such a three hinge method. This does not damage the stability of the structure but will help to relieve the member from the expansion stresses and also those that arise from the compression of the arch.

Sydney Harbour bridge is perhaps the finest example of a two-pinned steel arch of this type. The bridge was built by Dorman, Long & Co. of Middlesbrough between 1925 and 1932 and at the time was the largest steel arch bridge in the world. The total length is 3,770 feet, total width 160 feet and the total height 437 feet, or 75 feet higher than St. Pauls. The main arch span is 1,650 feet with a high water clearance of 172 feet. The bridge was designed to carry two electric overhead railway tracks, tram tracks, vehicle lanes and two cycle and footways, although the tram tracks have since been pulled up and converted into extra vehicle lanes, making a total of eight lanes with a width of 57 feet. During the first years of use the bridge was crossed every hour by 160 trains, 6,000 vehicles and some 40,000 pedestrians: nowadays in the region of 100,000 vehicles cross every day. 50,000 tons of silicon steel were used in the construction and the total cost was £4,200,000. The main span was erected by the cantilever principle, building out towards the centre from both shores. Fig. 2 is a simplified outline sketch of the

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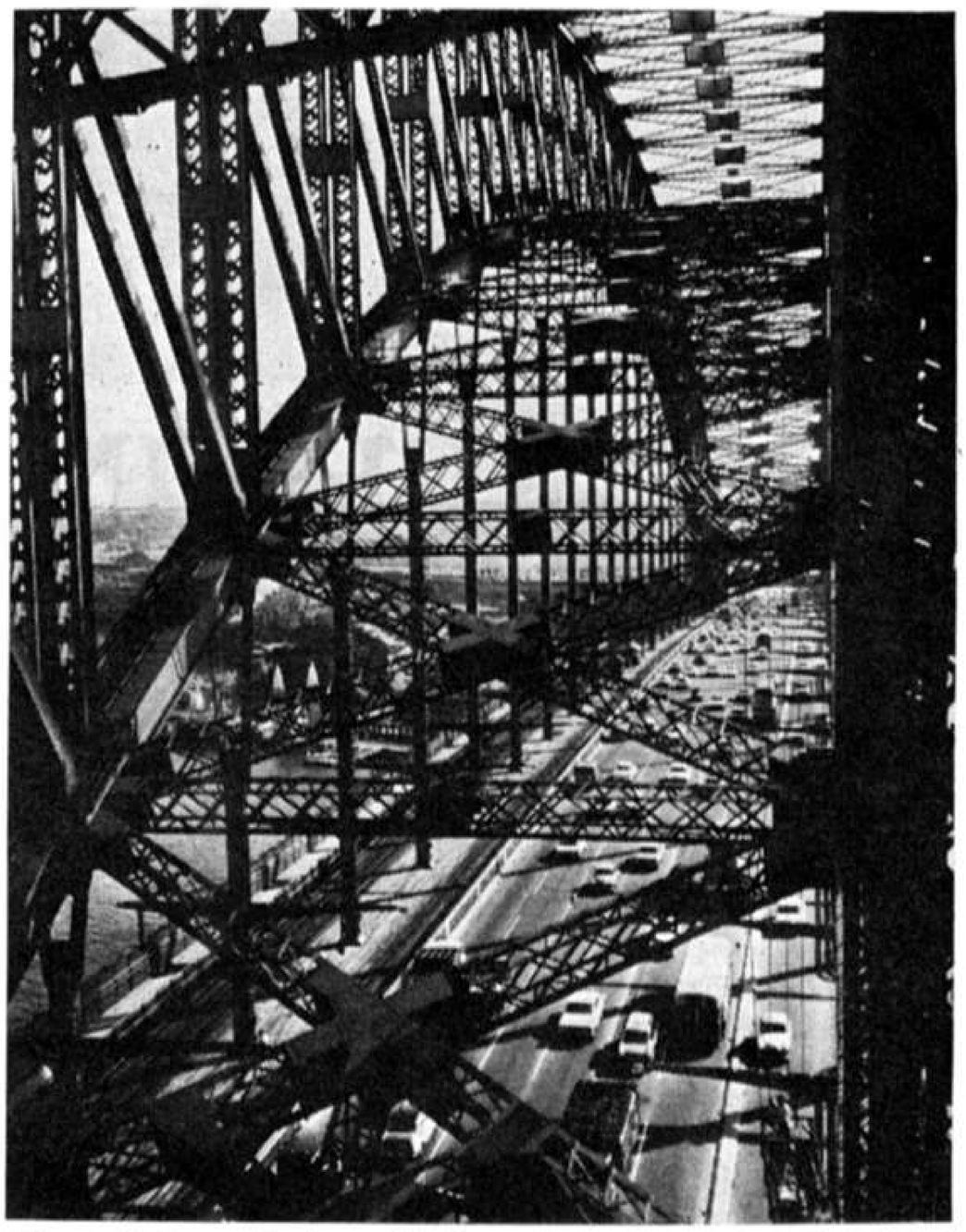


Above, Sydney Harbour Bridge pumps upwards of 40,000,000 vehicles a year in and out of the city.
Centre, the bridge has eight lanes for cars, twin train tracks and two footways.
Below, the bridge also has a 172 foot water clearance to let even the largest of ships pass, this particular one being the Matthew Flinders bound for Japan.

MONARCHS IN STONE by E. Harper

AMONG all the multitude of London's statues, there are many outstanding ones of Royalty.

It is remarkable that after nearly five centuries, London's oldest statue of Queen Elizabeth I is in exceptionally fine shape. Today, as she rests in a niche or the outer wall of St. Dunstan's in the West, her panniers, farthingale and beautiful lace ruff collar are almost as good as new. The Crown and Regalia are also intact, as is the smile on her face.

Dated 1586, the statue at first stood over the West corner of Lud Gate, a prison mainly occupied by people in financial difficulties. During the Great Fire, although the prison was destroyed fortunately the statue suffered no damage.

In 1760 Lud Gate was pulled down as it caused an obstruction and it sold for £148. The statue was given into the care of Farringdon-without-Ward, to be placed in its present position in 1766.

Fortunately it escaped the wrath of Cromwell who caused so many monuments to be shattered. Not so fortunate was the statue of Charles I, in Whitehall.

The work of a Huguenot called Le Sueur, his name and the date 1633 can be seen on the left forefoot of the black horse. First erected in King Street, Covent Garden, where it stayed until the Civil War in 1642, it was hidden in the crypt of the Inigo Jones building of St. Paul's Church nearby.

Cromwell's men combed London unsuccessfully to find it until 1655 when it was ordered to be melted down. However, the metal worker did no such thing,

From left to right (above) George VI stands near the steps of Carlton House Terrace. George III on horseback in Pall Mall. In Golden Square stands George II. Henry VIII is situated outside St. Bartholomew's Hospital. Charles I marks the centre of London and in Queens Square is a statue thought to be Queen Anne. (Below) King George IV is often criticised for having no stirrups. James II sculptured by Grinling Gibbons. A bronze statue of Edward VII stands in Waterloo Place, George V in Old Palace Yard. In St. James's Square sits William III, while George I stands high up on top of St. George's church.

although he did make a fortune from selling false souvenirs of the metal. Charles II eventually bought it for £1600 and had it erected on its present site, which is where the original Charing Cross stood. The statue thus marks the supposed centre of London, for map-makers used the Cross as the centre.

It has since had a chequered career, having lost its sword twice, been hidden under sand-bags in World War One, evacuated in World War Two and formed part of an old street cry.

"I cry matches at Charing Cross
Where sits a black man upon a black horse".

was once the song of street traders dealing in matches.

Of all London's Royal statues, that of Richard I is the most dramatic. Cast in bronze by Baron Marochetti, the statue was erected in 1851. Sword aloft, backed by the Houses of Parliament, Richard Coeur de Lion defies the world. Even the bombs of the 'blitz' only succeeded in bending his sword, quickly repaired. His horse is as proud as the rider, the whole making an attractive addition to Old Palace Yard.

Queen Anne can be seen in London too. Her most distinguished statue stands in the courtyard of St. Paul's Cathedral, rebuilt in her reign after the Great Fire. The siting of this statue has caused problems on ceremonial occasions. When, for Queen Victoria's

From left to right, in the courtyard of St. Paul's cathedral stands another statue of Queen Anne. Queen Elizabeth I is London's oldest statue. Richard I sits in front of the Houses of Parliament.

Diamond Jubilee, some sought to remove it, she strongly objected on the grounds that it might start a precedent for moving a statue of herself one day. A charming statue in Queens Square is also thought to be of Queen Anne. Probably the work of Francis Bird, some claim it may be Queen Charlotte, but it is certainly an attractive figure of a Queen, whoever the sitter was.

Queen Victoria's best known statue is of course the Victoria Memorial outside Buckingham Palace, but Kensington Gardens too has an interesting statue, made by her daughter Princess Louise. In white marble, it stands between the Broad Walk and the Palace. It is interesting that the Queen is represented with the wedding ring on her right hand in both statues—a tribute to her German husband, for Continental wives wore their ring on the right third finger.

One of Britain's earliest Queens can be seen near Westminster Bridge. The sculptor, Thomas Thorneycroft, credited her with amazing equestrian prowess as she stands erect in her chariot with no reins to control her fiery steeds. With her are her two daughters, wisely sitting down. Boadicea's patriotism, which caused her death in A.D. 62 while defying the Romans, is typified in this dramatic representation of a Queen riding into battle.

It is strange to have to go to a hospital to find a statue of Henry VIII. London's oldest hospital, St. Bartholomew's, pays tribute to this monarch on its 1702 gateway. Henry refounded 'Bart's' in 1539. His statue by Francis Bird shows him standing in jovial dignity.

Kings are shown in many garbs. Grinling Gibbons favoured Roman style for his carving of Charles II outside Chelsea Hospital. British oak leaves decorate it on 29th May in memory of his escape by hiding in a Boscobel oak. A more weather beaten statue by a Danish sculptor, Cibber, of the Merry Monarch stands in Soho Square where Charles wears contemporary dress. Another Roman style statue is that of George II, Golden Square, described by Dickens as 'mournful' and carved by Nost in 1720. More imposing but dressed in the same sartorial style, James II is another work by Grinling Gibbons, commissioned for £300 by Rustat, Yeoman of the Robes. It shows a strong facial resemblance to that of Charles II by the same sculptor.

George I can claim to have the highest site among Royalty in stone in London. High up on the steeple of St. George's Church, Bloomsbury, he stands, disguised as St. George. The idea originated from a brewer more loyal than artistic. Not surprisingly, wits quickly saw the absurdity of this statue; one rhyme says,

"When Henry the Eighth left the Pope in the lurch
He ruled over England as head of the Church
But George's good subjects, the Bloomsbury people
Instead of the church, made him head of the steeple!"

Our two latest Royal statues show George VI in mantle near the steps of Carlton House Terrace and George V in Old Palace Yard. This statue was a National Memorial in association with playing fields in Britain. The work of Sir William Reid Dick and Sir Giles Gilbert Scott, the statue is unfortunately often the target for demonstrators' scribbles.

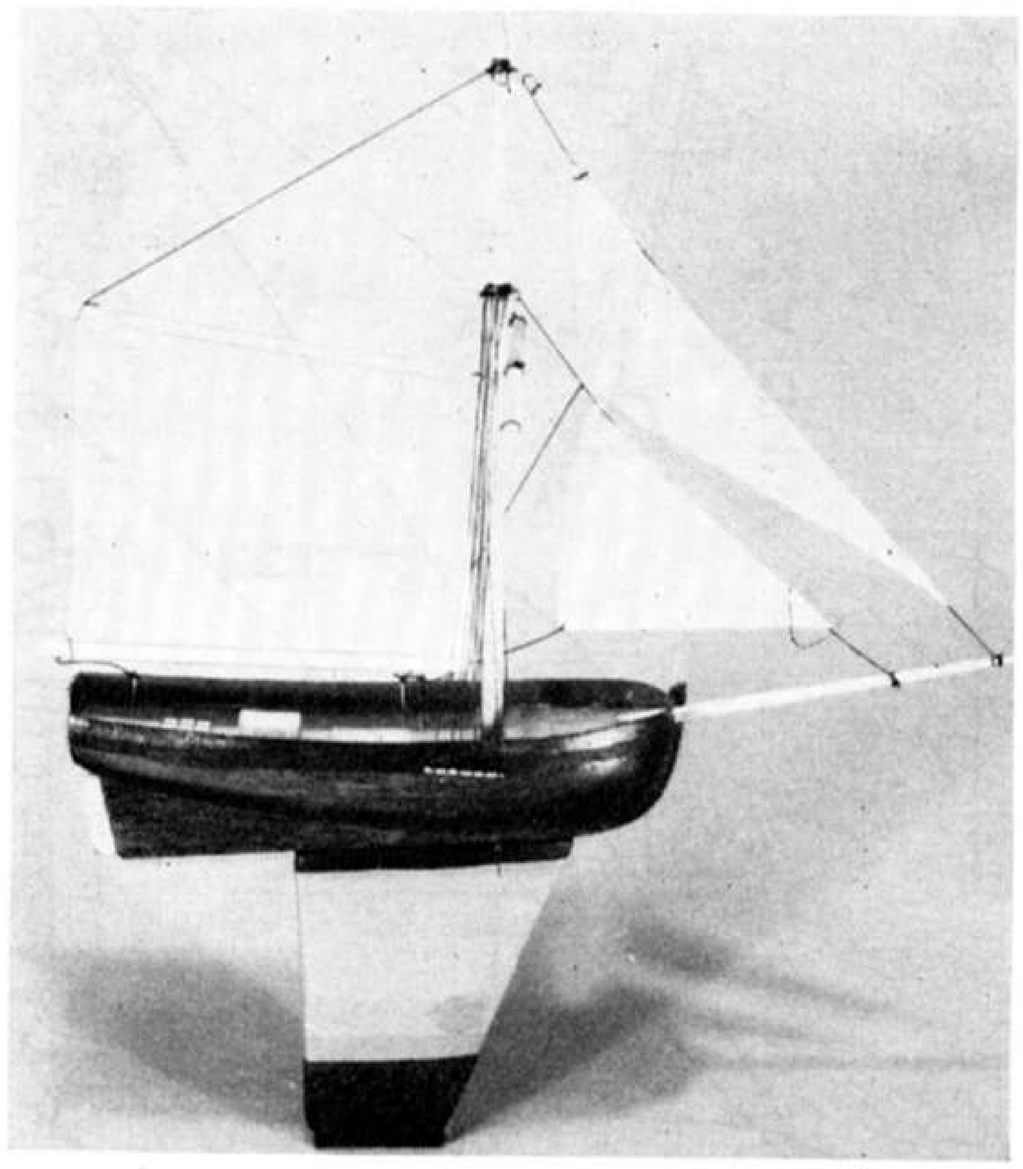
Equestrian statues, while imposing, often present pitfalls for the sculptor. George IV would surely have been extremely uncomfortable riding in Roman dress with no stirrups. He is said to have chosen this style and pose himself so perhaps Sir Francis Chantrey had no option but to oblige Royal whims.

William III's statue in St. James's Square recalls 'the little gentleman in the velvet jacket' whose molehill tripped the King's horse and killed the rider at Hampton Court. Possibly the most attractive Royal statue in London, it was paid for by Samuel Travers but erected in 1806 after his death.

Wyatt, the sculptor of George III on a horse in Pall Mall, described himself as an amateur. Much patronised by his King and Queen, he was given the task of designing the King's statue and produced an attractive lively work of art.

Waterloo Place was chosen for the bronze statue of Edward VII. An Australian, Sir Bertram Mackennal produced a graciously dignified monarch, superbly in control of a rather bad-tempered mettlesome horse. Another statue of this King in Whitechapel was paid for by the Jews in London's East End.

Whether sitting, standing or astride a horse, our monarchs add interest to their capital. Yet only one seems to find the scene amusing. One wonders, did Good Queen Bess share a joke with the sculptor who portrayed her? Or was she normally a happy queen?



A Miniature REVENUE CUTTER which actually sails!

Full-size plans by M. M. Staff

THIS little model is based on the well-known revenue cutters of the late 18th and early 19th centuries. These small vessels, descended from Dutch yachts, were first built for the Navy as dispatch vessels but proved fast and handy and therefore ideal for chasing the vast numbers of luggers and sloops which in these days carried out an enormous amount of smuggling. Speed was essential in view of the relatively short distance the smugglers had to sail from the French coast, and this led to more and more sail being carried by the cutters. In heavy weather the bowsprit could be run in and sail shortened right down; it was this movable bowsprit that defined a cutter.

The example shown carries eight guns, which were probably 3 pdrs., but some of these little craft carried six guns a side, two stern-chasers, and two or three deck-mounted swivel guns, on a hull length of about 60 ft.

Our model is built on a centre profile of $\frac{1}{8}$ in. hard balsa with two $\frac{1}{2}$ in. balsa laminations cemented each side before carving and sanding to shape. The deck can be covered with paper on which the planks etc. have been drawn with a sharp pencil, and the bulwarks are then fitted on, using $\frac{3}{16}$ in. wide strips cut off cross-grain from a $\frac{1}{16}$ in. sheet. Cement the chain-plates on, then apply sanding sealer, sand thoroughly, and paint the hull medium brown. If desired, the below water-line section can be cream, green, or black, and the inside of the bulwarks red.

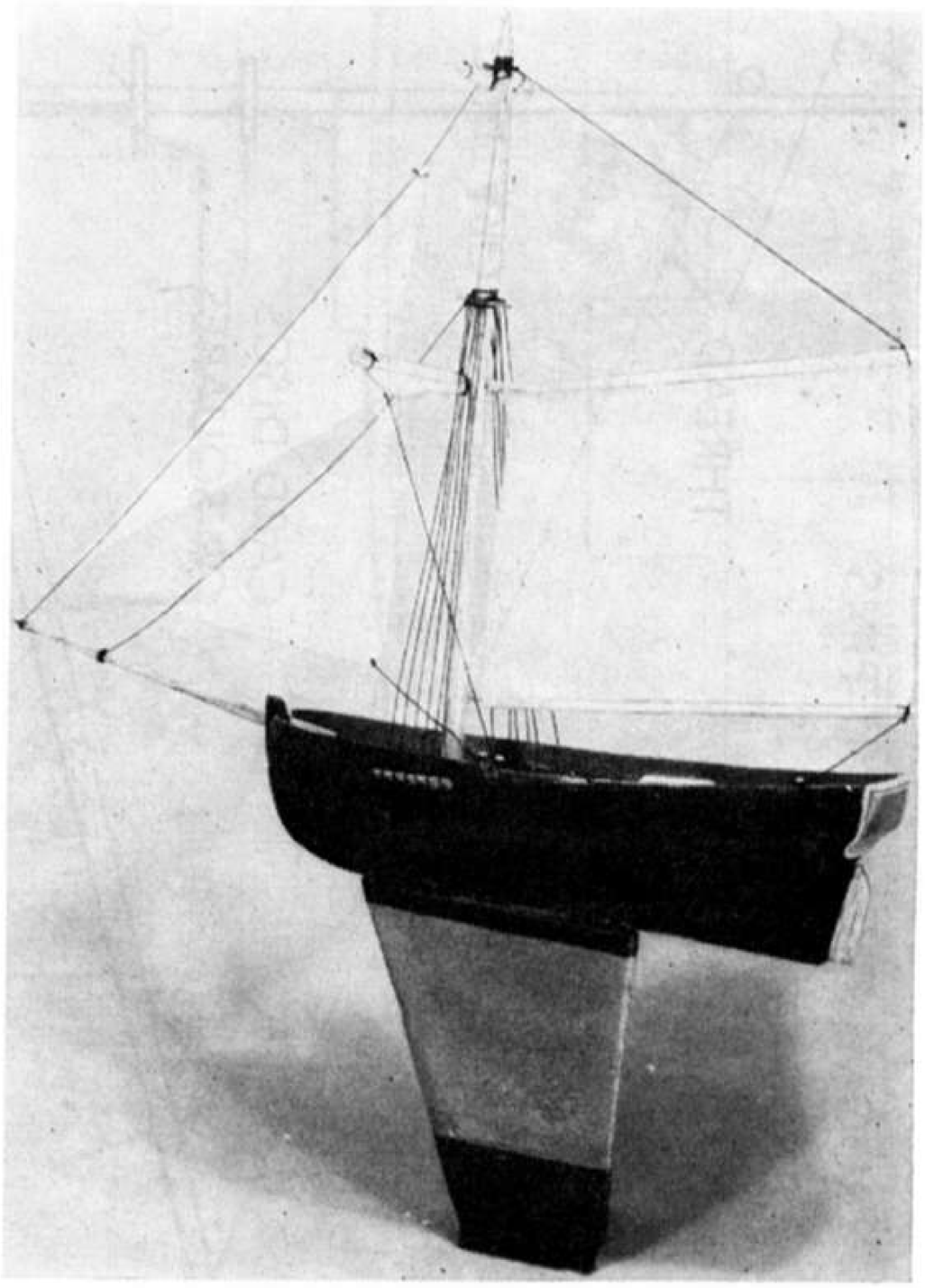
With so small a model, the mast and spars can be hard balsa, which is easier to taper than dowel. Glue the mast in a drilled hole in the deck and make the shrouds with black cotton. Glue one end (with a bit spare) in a nick in one chain-plate, pass it one turn round the mast, and glue into the corresponding nick in the other plate. Do this for each pair of shrouds. Make pin-holes in the hull below the plates, trim the loose shroud ends, and push them into the pin-holes (with a pin) with a touch of glue.

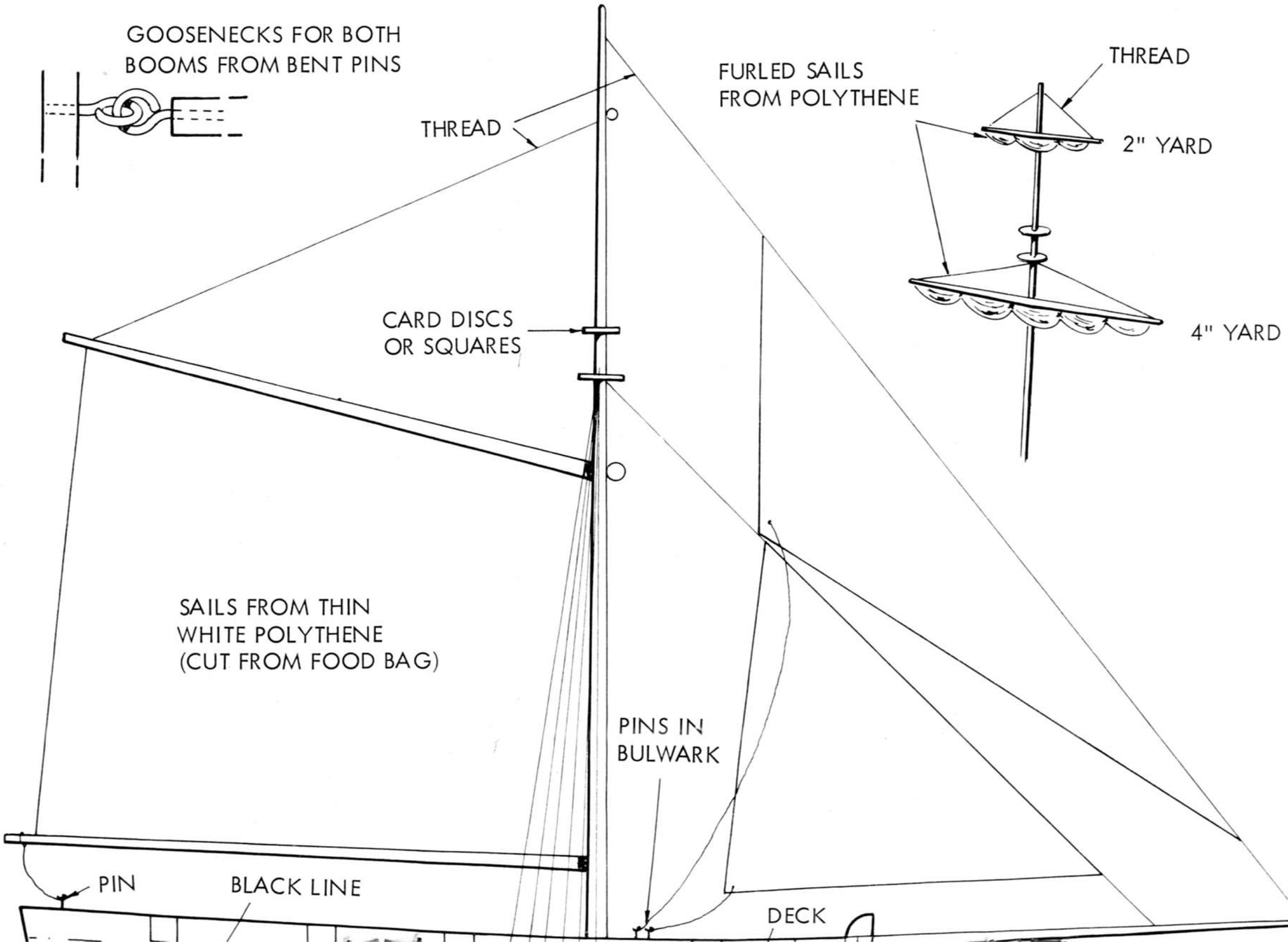
The mainsail gaff and boom are attached to the mast with clipped-off pins made to as small an eye as possible, and the foresail and jib are glued direct to the thread stays, so the basic rigging is next. It is advised that the two square sails on the mast are shown furled, otherwise if you sail the model it will tend only to blow downwind, so there are just three sails to cut from a lightweight white polythene food bag. These are stuck (Bostik No. 1 is best, but a contact adhesive will do) to the gaff and boom, and the stays, as appropriate.

Small pins (lills) driven into the bulwarks provide points on which the sheets can be made off, and the sheets are just cottons knotted and glued to the clew (bottom rear corner) of each sail.

Deck detail—gratings, bitts, etc.—are sketched on the plan, as is gun construction. These should all be made from scraps of wood or plastic rather than metal, to save weight.

For sailing, a false keel is essential, both for stability and to prevent the model from simply blowing side-ways. Weigh the complete boat, then cut a piece of sheet lead heavy enough to bring the total weight up to approximately $1\frac{3}{4}$ ozs. and fold it on to the false keel. The keel becomes virtually invisible when the model is afloat, and the interest that the sight of so different a model will arouse will well repay the time in building it.




GOOSENECKS FOR BOTH
BOOMS FROM BENT PINS
THREAD
CARD DISCS
OR SQUARES
SAILS FROM THIN
WHITE POLYTHENE
(CUT FROM FOOD BAG)
PIN
BLACK LINE
PINS IN
BULWARK
DECK
FURLED SAILS
FROM POLYTHENE
THREAD
2" YARD
4" YARD

CUT TWO 1/2" LAMS. TO THIS LINE

CUT TWO 1/2" LAMS. TO THIS LINE

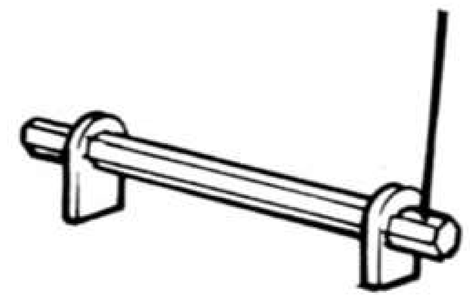
CUT ONE 1/8" FULL PROFILE (LESS BULWARKS)

WL

SCORE

1/8" SAILING FIN CEMENTED TO PROFILE

1



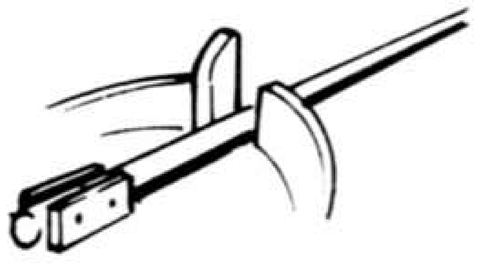
WINDLASS

3

ALUMINIUM FOIL TAB

SQUEEZE LEAD SHEET

2

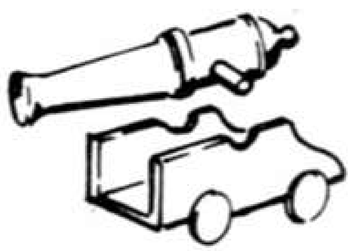


BOWSPRIT HEEL

CHAINPLATE 1/16" BALSA

SKYLIGHT

WINDLASS



GUNS

GRATING

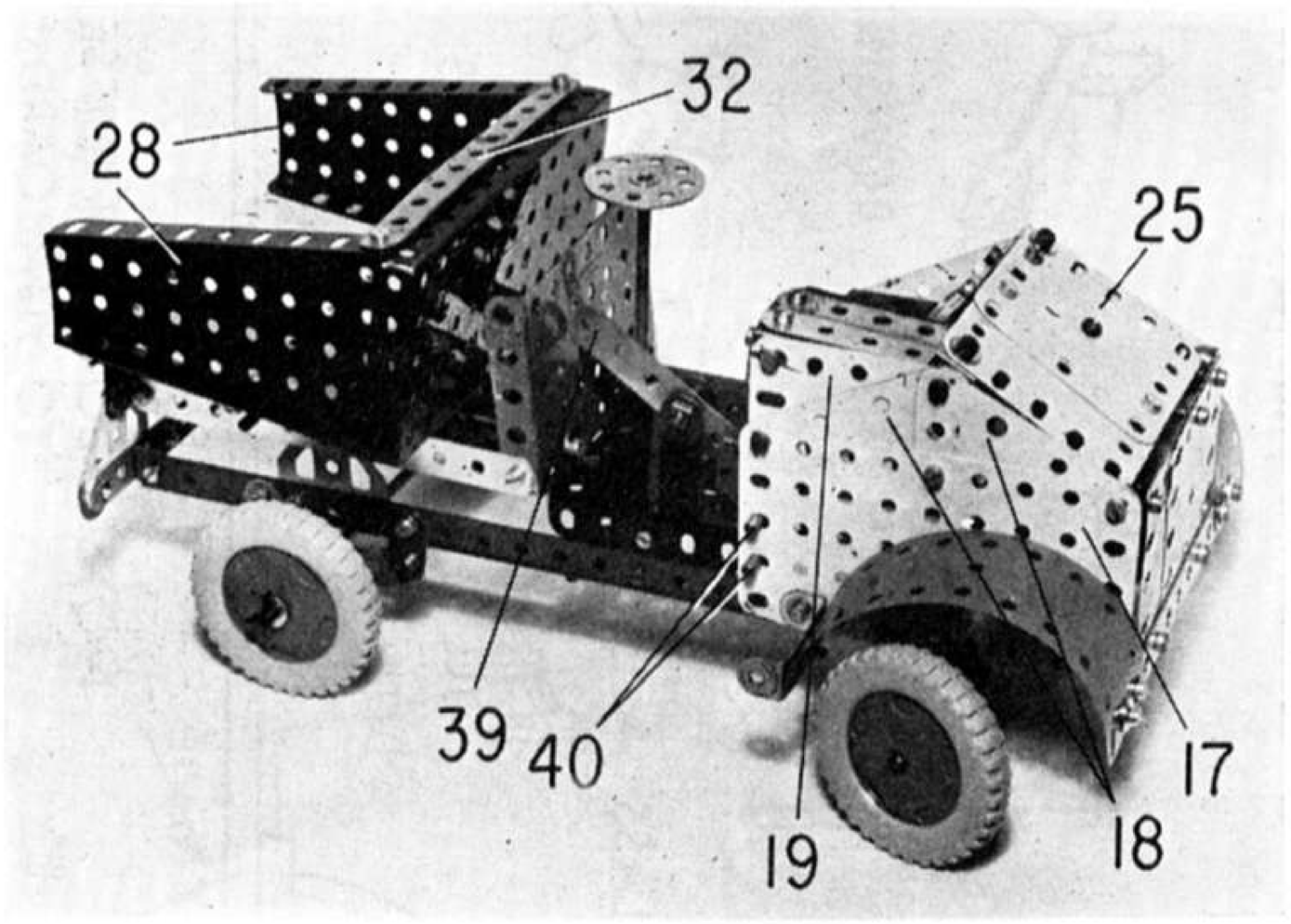
GUNS

BITTS

BITTS

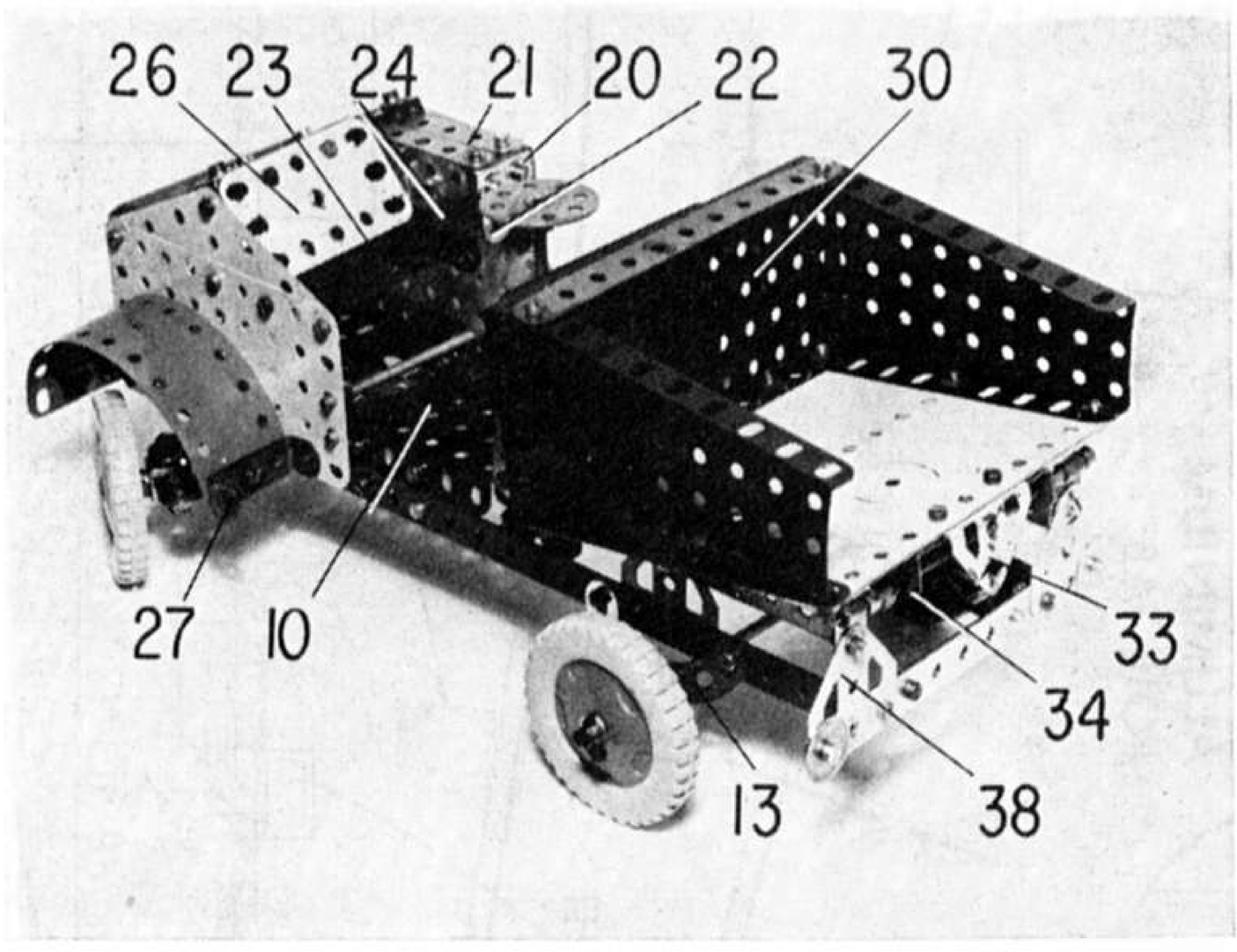
NOTE - BOWSPRIT OFFSET TO STARBOARD

3 2 1



DUMPER TRUCK IN MECCANO

'Spanner' describes a No. 7 Set model built by M.M. reader B. Comley



LAST month in Meccano Magazine we gave (rather late!) the results of the Meccano Set model-building contest we ran at the beginning of 1971. Readers who saw last month's feature will remember that we included an illustration of a Dumper Truck built by Master B. Comley of Northfield, Birmingham and entered by him in Sub-section 7 of Section A of the competition. This indicates that the model was built from a No. 7 Meccano Set and that the builder was under 14 years old.

The model did not actually win a prize in the competition, owing to the very high standard of entries in the Sub-section, but it was still a first-class construction, worthy of the highest praise—especially considering the builder's age! We said last month that we would give full building instructions for the model in due course and so, true to our word, here they are. Before going into detail, however, I should just like to say that I have written the instructions from the photographs of the model which were supplied with the entry. I had nothing else to go by, therefore it is possible that I have made a few errors in the description where I could not see exactly what sized parts were used. (The Rods, particularly, were a problem). If I have boobed, I trust Master Comley will forgive me!

Chassis and Steering

The chassis is built up from two 12½ in. Angle Girders 1, connected together at their ends by two 3½ × ½ in. Double Angle Strips 2 and through the fourth holes from the rear by a 5½ in. Strip 3, the last serving as the rear axle cross-member. Locknutted through each end hole of the Strip is a Double Bracket, the securing Bolt also fixing a 1½ in. Strip 4 between the lugs of the Bracket, as shown, then Strips 4 at each side are connected by a 5½ in. Strip 5, this also lock-nutted in position. The stub axles—supplied by 1½ in. Rods—are of course journalled in the lugs of the Double Brackets, each being held in place by a Collar and a 2½ in. Road Wheel 6.

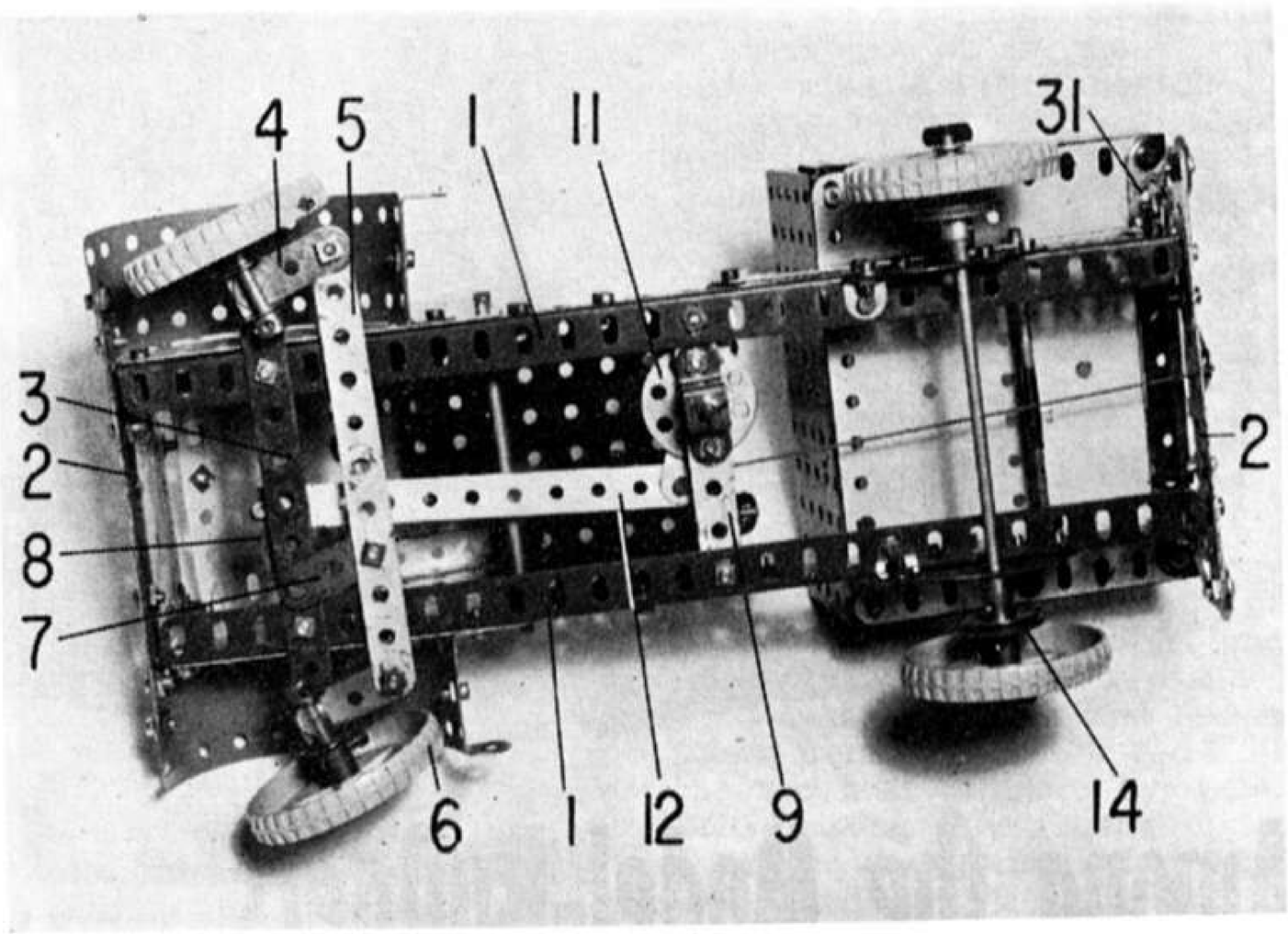
Steering control is achieved by an interesting and slightly different linkage from the normal on this particular model. A 1½ in. Strip 7

Above, the chunky appearance of Master Comley's Dumper Truck shows clearly in this illustration. Remember that the dumper bucket is at the front of the model.
Left, in this general front view of the model, the simple but effective construction of the dumper bucket is clearly shown.

is tightly fixed by a Nut on a $\frac{3}{8}$ in. Bolt, then the Bolt is passed through the fourth hole of Strip 3. Another $1\frac{1}{2}$ in. Strip 8 is tightly locked by Nuts on the Bolt shank, this being positioned roughly at right-angles to Strip 7 and arranged on the Bolt so that the Bolt is free to turn in Strip 3, but is not excessively sloppy. Strip 7 is lock-nutted to Strip 5.

Girders 1 are next connected through their twelfth holes from the front by a $3\frac{1}{2}$ in. Strip 9, after which a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 10 is "butted" to the top of the Girders by Fishplates. Journalled in this Plate, in Strip 9 and in a Double Bent Strip bolted to the underside of the Strips, is a 4 in. Axle Rod serving as the steering column and held in place by an 8-hole Bush Wheel 11 above the Strip and by a Spring Clip beneath the Double Bent Strip. Bolted across the Bush Wheel is a 2 in. Strip which is connected to the end of Strip 8 by a $5\frac{1}{2}$ in. Strip 12, lock-nutted in place to complete the steering linkage. A second 8-hole Bush Wheel serves as the steering wheel.

The front axle is supplied by a $6\frac{1}{2}$ in. Rod held by Collars in the centre holes of two $2\frac{1}{2}$ in. Stepped Curved Strips 13 attached to Girders 1. Note that the rear end of each Curved Strip is bolted direct to its respective Girder, while the forward end is attached to an Angle Bracket and Fishplate bolted to the Girder. A 1 in. Pulley 14 is added to each end of the Rod, followed by a $2\frac{1}{2}$ in. Road Wheel. This Wheel is free to turn on the Rod, being held in place by the Pulley and by a Spring Clip on the end of the Rod, the Spring Clip spaced from the Road Wheel by a Washer.



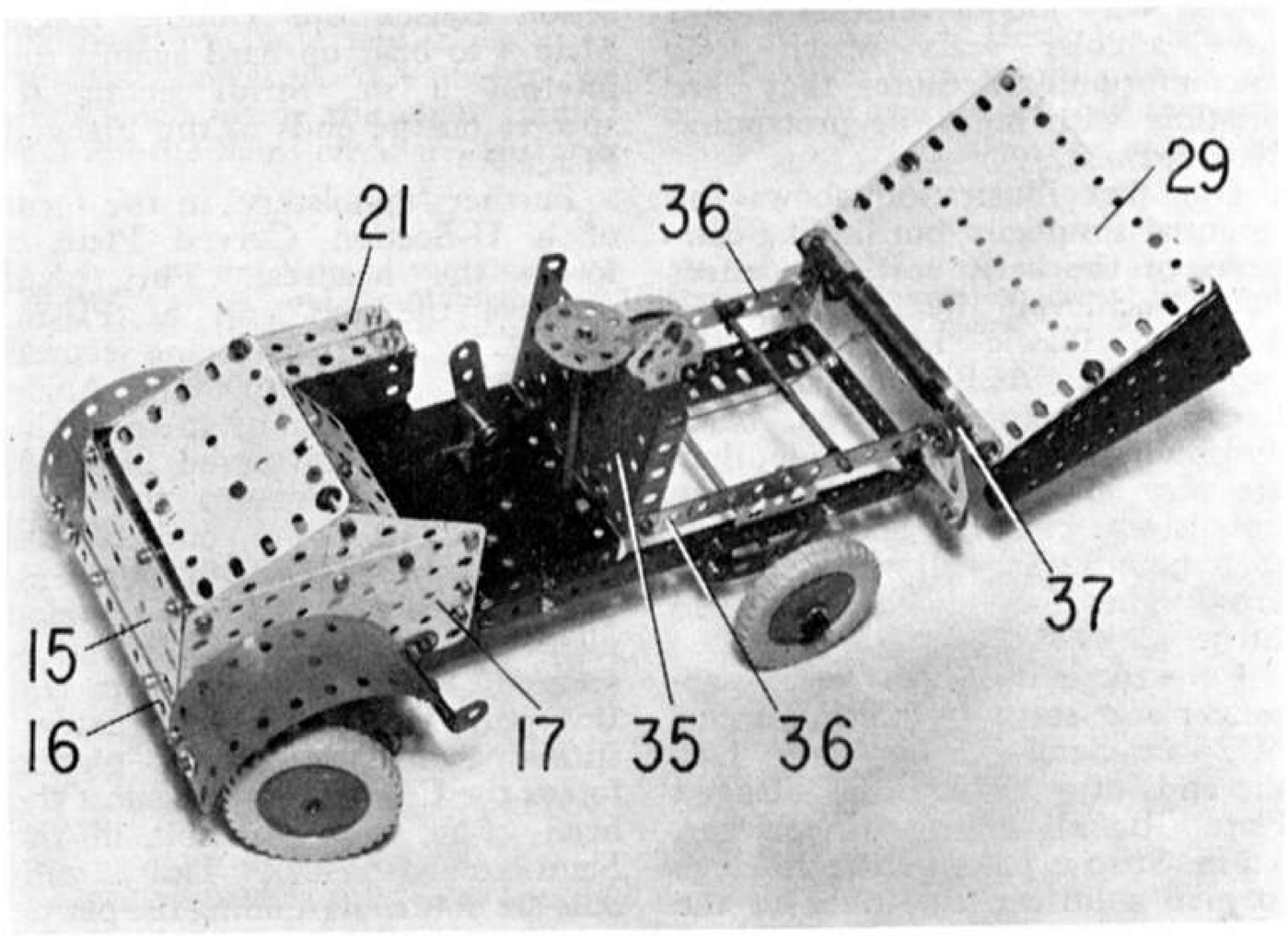
Engine Cover and Seat

Moving to the engine cover, a $3\frac{1}{2} \times 2\frac{1}{2}$ in. compound flexible Plate 15, overlaid along its lower edge by a $5\frac{1}{2}$ in. Strip 16, is bolted to rear Double Angle Strip 2, while two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 17 are bolted one to each Girder 1 in the position shown. The compound plate is built up from two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates, overlapped three holes, with the inside upper edges overlaid by a $3\frac{1}{2}$ in. Strip. The ends of this Strip, with the plate, are attached to the upper rear corners of Plates 17 by Angle Brackets, at the same time helping to extend the top of each Flat Plate with two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plates 18, arranged to form a wide triangle.

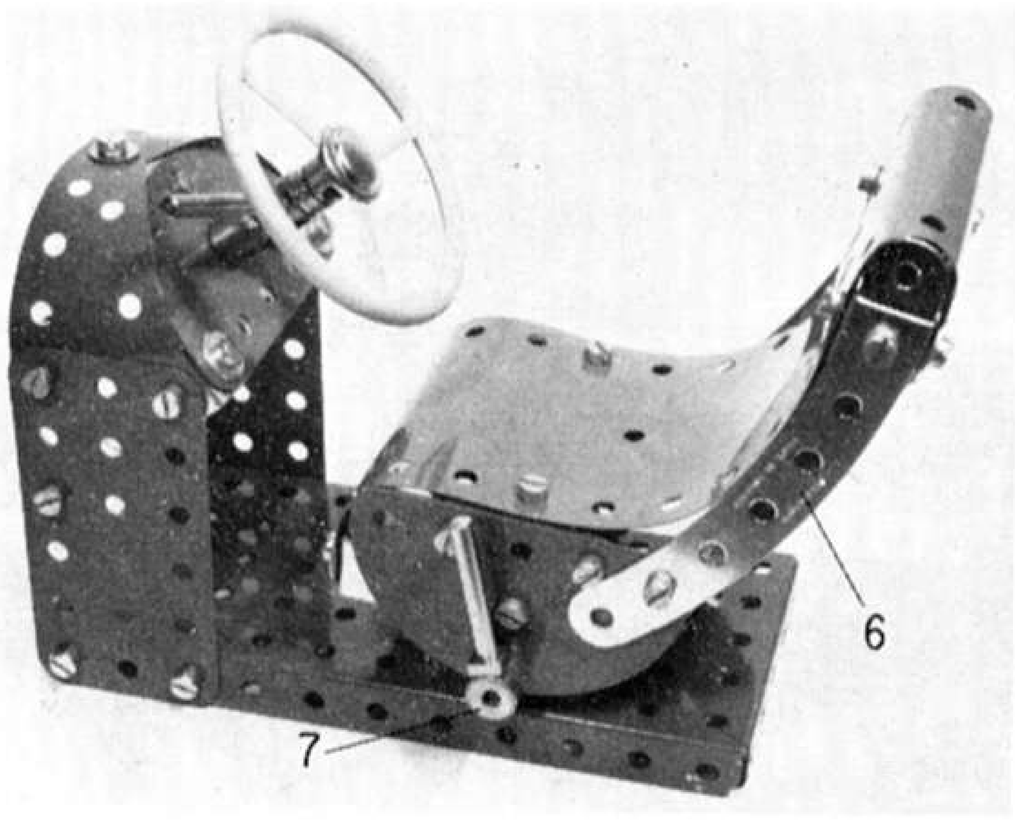
Bolted as shown to the left-hand of these triangles is a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 19, to the forward corner of which an Angle Bracket is fixed. Secured to the spare lug of this Angle Bracket are another Angle Bracket 20, a Fishplate and a $2\frac{1}{2}$ in. Strip 21, a second $2\frac{1}{2}$ in. Strip and another Angle Bracket being bolted to the end of the Fishplate. The second Strip is arranged parallel to the first Strip, as can be seen in the accompanying photographs. A Fishplate 22 is bolted to the spare lug of the last Angle Bracket.

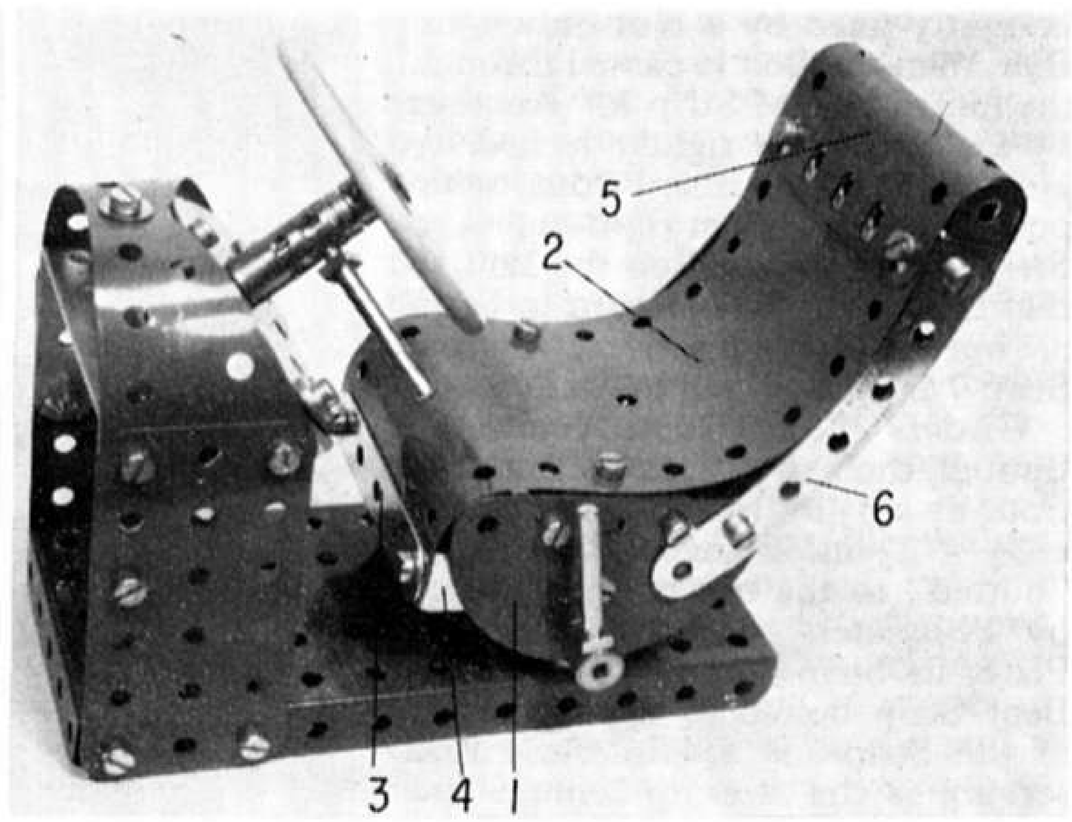
The seat is supplied by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 23, bolted to the forward upper edge of right-hand Flat Plate 17, a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 24 being bolted to the spare flange of this Plate. The engine cover is then completed by a compound $3\frac{1}{2} \times 2\frac{1}{2}$ in. flexible plate 25, built up from two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates, attached by Angle Brackets to the apexes of the earlier-mentioned "triangles". A seat-back is provided by a final $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 26, attached to the compound plate by further Angle Brackets, while each rear mudguard is built up from a curved $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate bolted to Strip 16 and to a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 27, bolted to Flat Plate 17.

(*continued on page* 203)



Above, an underside view of the Dumper Truck built by B. Comley from a No. 7 Meccano Set and entered by him in last year's model-building contest. The model incorporates rear-wheel steering.
Right, a general view of the Dumper with the bucket in the "tipped" position.





Above left, an adjustable seat designed by Bert Love of Birmingham to show that Meccano-built seats can be realistic, attractively-shaped and comparatively free of uncomfortable obstructions.

Above, another view of the basic seat showing its comparative scale with the larger Meccano Steering Wheel.

Among the Model-Builders

with 'Spanner'

DESIGN engineers have two well-known comments on development projects, one being "If it works right, it should look right" and the other, "The simpler its construction, the less there is to go wrong". With these home-spun truths in mind 'Among the Model-builders' this month deals with the development of a theme on a reclining chair. The illustrations and models, supplied by Bert Love, are really in the form of suggestions to set the model-builder thinking for himself, and it will be seen that, although, Meccano Parts are basically angular in form, there is no reason why model vehicles should have angular seats which look uncomfortable because they are bristling with holes, or protruding Nuts & Bolts.

Our first illustration shows the essential simplicity but lifelike contours of the basic seat, this effect being achieved by the use of Meccano Plastic Plates for the 'upholstery'. As Plastic Plates have been manufactured in red, black and blue over the past decade, they are very suitable for contemporary upholstery colours, and each of them blends very well with the modern bright zinc finish of Meccano Strips.

Construction of the basic passenger seat starts by bolting a pair of $2\frac{1}{2}$ in. Semi-circular Plates 1 to the ends of a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate. Before doing so, however, a 2 in. Strip is placed on each flange to give a little extra width to the spacing of the Semi-circular Plates. This allows the $5\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 2 to take up a natural form between the chair sides, towards the front. The lower end of the Plastic Plate is trapped between a $2\frac{1}{2}$ in. Strip 3 and a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Double Angle Strip 4, the latter then going in between the side plates of the seat where it is secured in place by one Nut and Bolt only, at each side, in the centre of the Semi-circular Plates.

The Plastic Plate is next bent over the seat until the 5th side holes can be bolted to the centre line of the $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate. This action causes the Double Angle Strip 4 to bear up hard against the internal 2 in. Strips acting as spacers on the ends of the Flanged Plate.

Further 'upholstery' in the form of a U-Section Curved Plate 5 forms the headrest. This plate overlays the top end of Plastic Plate 2, both the parts being secured to a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip, bolted one hole in from the end of two 4 in. Curved Strips 6, on each side to form the back support. The lower end of the Curved Strip is similarly attached, one hole from the end, to the side plate of the seat. Note that it is secured, again, by one Nut and Bolt only, but the rearward natural springing of the plastic plating forces the Curved Strips against the head of an adjacent Bolt in the Semi-circular Plate. Thus, with only six boltheads holding the plastic upholstery (which is very pleasing to the touch in its contoured shape), we have an elegant seat form interlocked by its own fastenings.

The two lower Bolts securing the Curved Strips also hold a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip which not only gives additional bracing between the chair sides, but also allows the upholstery to be completed at the rear with the addition of a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic or standard Flexible Plate. This is attached by its slotted holes at the top to the back of the headrest, is overlaid with a $2\frac{1}{2}$ in. Strip for external appearance, and is secured at the lower end, one hole up from the slots, to the Double Angle Strip mentioned. The entire construction of the basic chair is as simple as that!

Now we come to the self-locking device, again, very simple, but quite positive. Any substantial Meccano baseplate will do for mounting the chair which pivots fore and aft on a $2\frac{1}{2}$ in. Axle Rod. This is passed through the far side of the seat in the bottom hole of the Semi-circular Plate, then through a Collar and finally into the open end of a Rod Socket. The threaded tip of the Rod Socket comes through the bottom of the nearside Semi-circular Plate which is held captive by a Washer (preferably a thin brass Electrical Washer) to reduce enamel scoring, and a Threaded Boss 7 to act as a locking nut.

Attachment of the Collar and

Rod Socket to the baseplate is as follows: space the Collar and Socket at 2 in. centres and pass $\frac{3}{8}$ in. Bolts for each, up through the baseplate from below, packing them with half-a-dozen Washers as they protrude. The boltshanks go into the tapped bores of the Collar and Rod Socket respectively and, as these two items are also fitted with their own Grub Screws, a very positive hold is achieved on the $2\frac{1}{2}$ in. Rod. Finally, a Long Threaded Pin is secured tightly in the cross bore of the Threaded Boss, this acting as an instant-lock lever which permits the passenger seat to be inclined to any desired angle and to be instantly locked in place.

So much for the basic seat, but what ideas does it conjure up for the constructor? Providing the steering wheel in the photographs is quite incidental, yet it does show how the basic form lends itself to a passenger seat for a sports car, for instance. Other forms, such as aircraft or trans-continental railway passenger seats, come to mind and no doubt individual constructors will have other ideas. In Bert's case (although I am assured that he has no particular brief for dentistry) these "other ideas" resulted in the very neat and fully-equipped dentist's chair shown in the remaining illustrations. The general effect of the chair is most realistic, the 'stainless steel' pedestal basin and the fearful 'drill' completing the fiendish equipment!

First job is to raise the chair to operational height and to provide it with a swivelling motion. A strong base for the chair is made from a $1\frac{1}{2}$ in. Contrate Wheel 1 secured to a Wheel Flange by $\frac{1}{2}$ in. Bolts going through the baseplate. Thanks to the bright zinc finish on modern Meccano parts (which shines like chromium plate after a brisk rub with a domestic metal polish) a versatile 'stainless steel' capping is provided by a Chimney Adaptor 2 which has several applications in the model. Two of them, mounted back to back, provide a very substantial swivel bearing for the dentist's chair. A second $1\frac{1}{2}$ in. Contrate Wheel bolted to a separate $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 3 provides a sturdy journal for a $1\frac{1}{2}$ in. Axle Rod on which the chair swivels, while the Flanged Plate provides tilting journals for the actual seat.

Basic construction of the chair is similar to that already described, but with one or two additions. Armrests are provided by 3 in. Curved Strips 4, attached at the rear to the chairback by Nuts and Bolts. At the front, however, they are simply sandwiched inside the chair frame, between the Semi-circular Plate and the 2 in. packing Strips, the 'stepped' portion of the Curved Strips acting as a convenient shoulder stop to the insertion. Short Angle Girders, fitted with $1\frac{1}{2}$ in. Insulating Strips from the Electrical Set, complete the armrest 'pads'. Leg and footrests are made from a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 5, reinforced by two $2\frac{1}{2}$ in. Strips set at an angle to suit the Constructor and bolted under the leading edge of the chair, with a $1\frac{1}{2}$ in. Angle Girder completing the footrest.

The locking mechanism, fully illustrated in one of the photographs, is basically similar to that for the original chair, but this time two Collars are included as it is not possible to secure the Rod Socket shown from below. The two Collars are held in place by $\frac{3}{8}$ in. Bolts passing through the upper Contrate Wheel, the Bolts being lock-nutted to Flanged Plate 3. Also a 3 in. Axle Rod is used so that the electric 'drill' motor can be mounted integrally with the dentist's chair, on the outside end of the Rod. Locking is as in the prototype basic chair.

The ancillary equipment fitted is, of course, incidental to the basic design but, since its construction is so simple, it has been included and a brief description is given here. The pedestal basin makes use of current Meccano Parts so that the bright zinc finish overall does give a professional appearance. The dental syphon tube 6 is supplied by six inches of Flexible Spring Cord secured at one end in the cross-bore of a Threaded Coupling by a short Grub Screw. A standard Bolt from inside the upper Chimney Adaptor 7 fixes the Threaded Boss to the pedestal. The syphon swan-neck is simply a Hook for Spring Cord which lodges conveniently in one hole of the Boiler End forming

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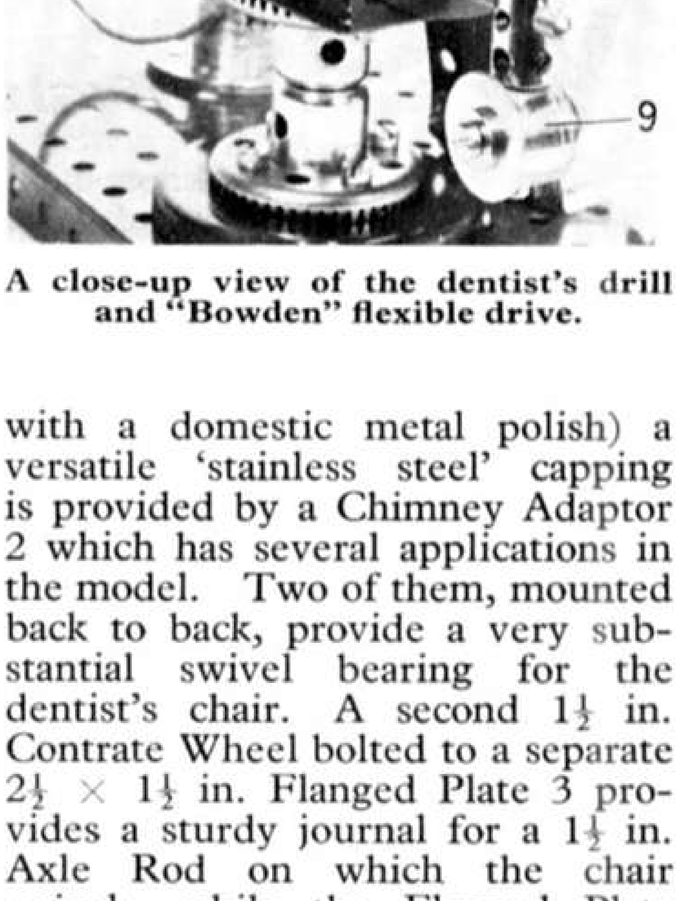
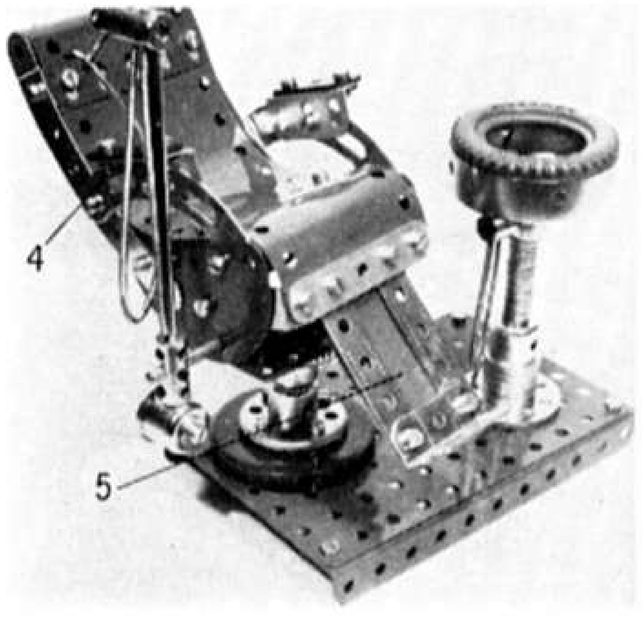


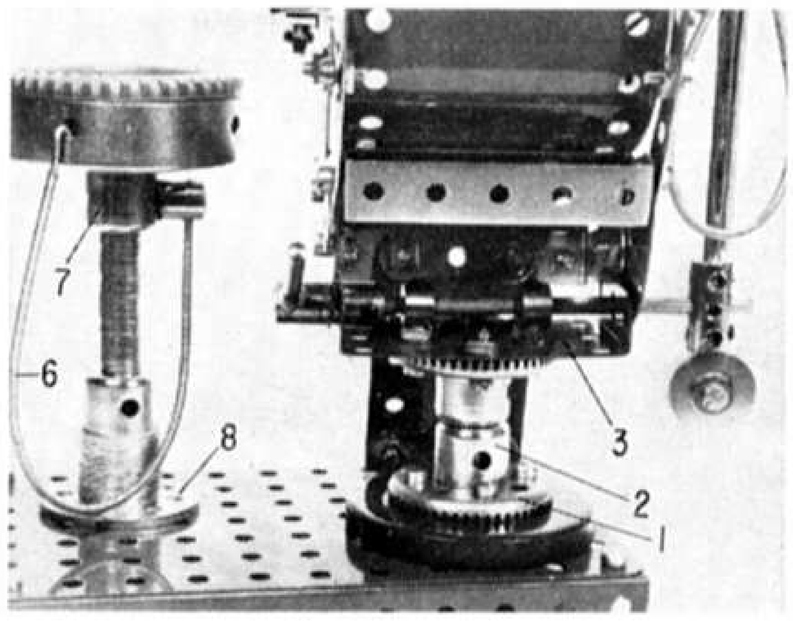
A close-up view of the dentist's drill and "Bowden" flexible drive.

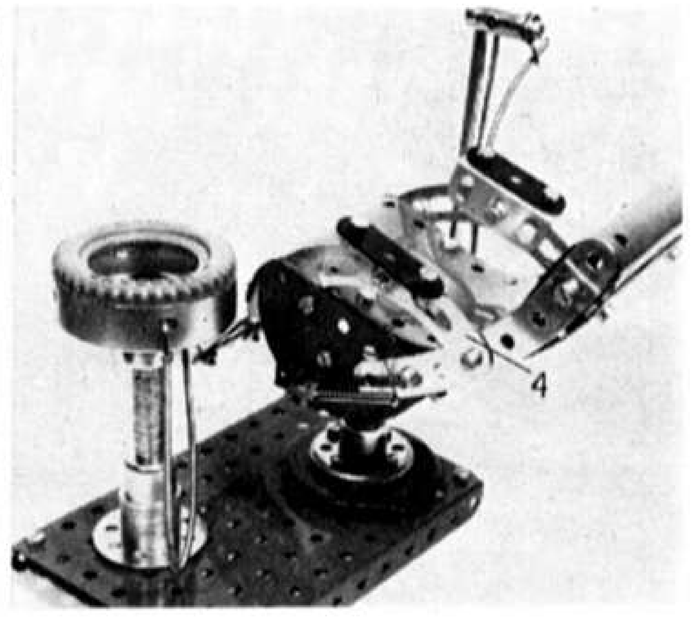
A magnificent extension of the basic seat is this amazingly realistic Dentist's Chair which illustrates how the seat can be adapted for specific purposes with a little thought.

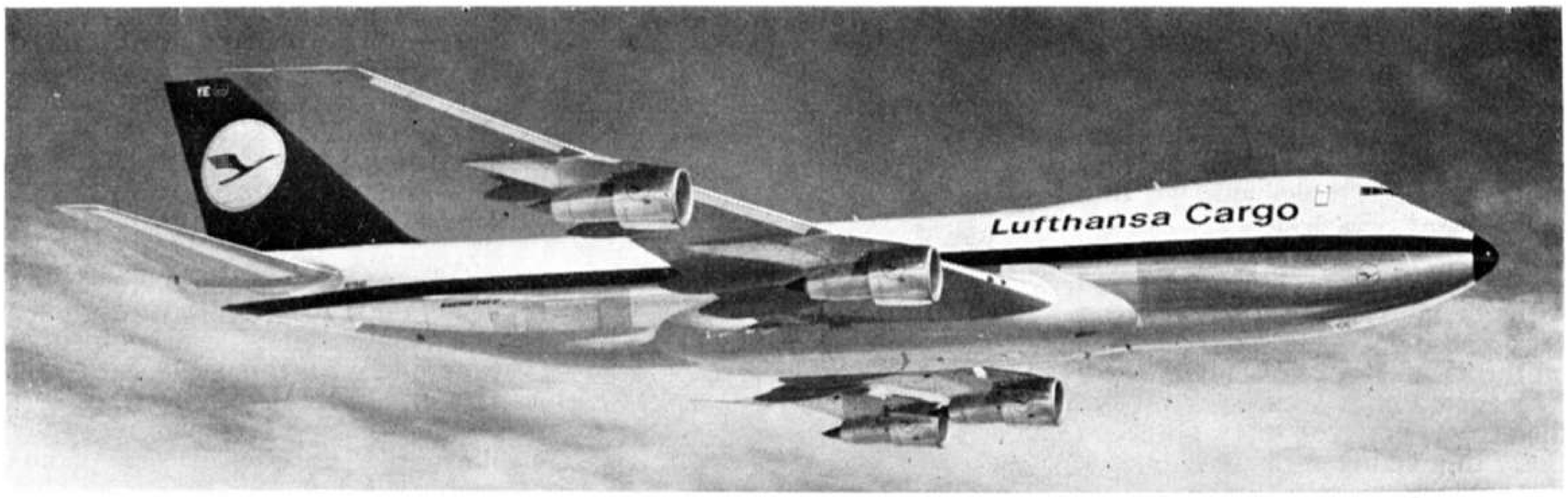
In this close-up view of the Dentist's Chair, the swivel and the pivot mountings are shown in detail.

Further details of the dental apparatus showing the "stainless steel" pedestal basin.









AIR NEWS

By John W. R. Taylor

Jumbo Look for MSA 707's

Not all passengers like the huge cabins of "Jumbo jets", and not all airlines need or can afford such aircraft. To give a feeling of spaciousness to their smaller types, such as the 707, Boeing have evolved a scheme known as the "superjet look" which can be applied retrospectively to aircraft already in service.

One of the operators which has taken advantage of the new-look scheme is Malaysia - Singapore Airlines, and when the first of its remodelled 707s flew into London Airport last Autumn the aircraft was quite an eye-opener. The normal coat racks, hung low over the seats, have been replaced by high-set flush-fitted lockers, while a false ceiling and new lighting have been installed, illuminating the side walls as well as the roof of the cabin.

The result is greater headroom and an end of the old enclosed feeling experienced by some passengers on long flights. The "Jumbo's" impression of spaciousness is combined with the more personal service that passengers can be given in a smaller aircraft. And, of course, hand baggage can be put into the lockers instead of cluttering the cabin floor.

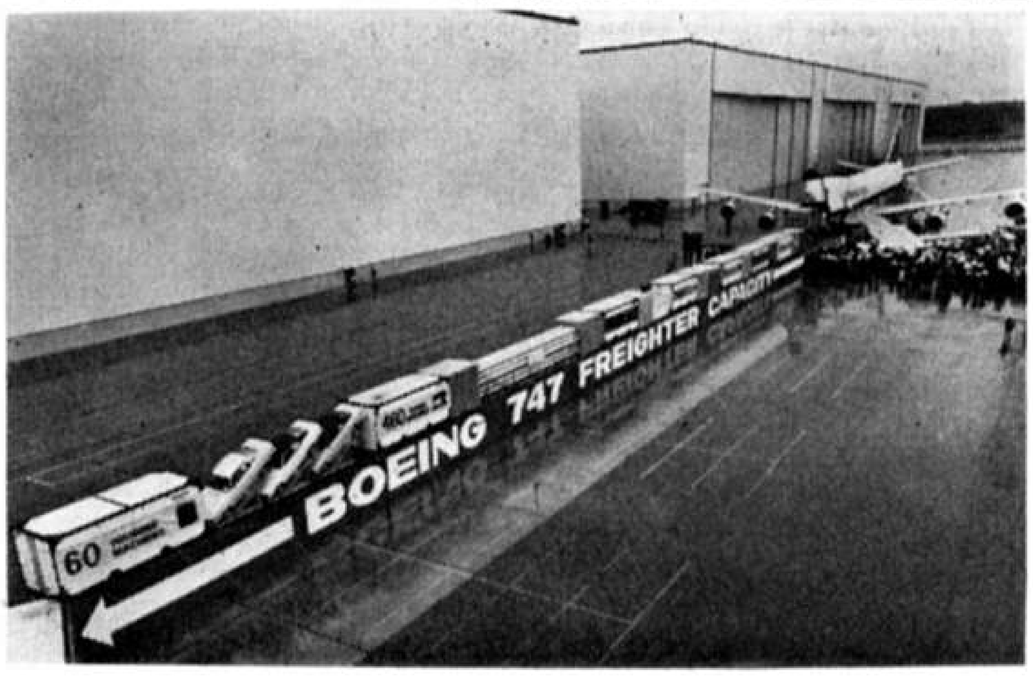
Jumbo Nose-Loader

First airline to take delivery of a Boeing 747F, the special nose-loading version of America's giant "Jumbo-jet", is Lufthansa of Germany. Even when it is seen in the air, D-ABYE is clearly different from all the passenger-liners which preceded it; the absence of cabin windows makes the words "Lufthansa Cargo" painted on its top almost superfluous. But it is during loading and unloading on the ground that the 747F makes the biggest impression on anyone who watches.

It has been described as the greatest single development in the 60-year history of air freighting. This is easy to believe when you stand on the loading area at an airport and peer up at the hinged nose-cone of D-ABYE, towering 39 ft. above the ground. The open doorway to the upper deck is 8 ft. 2 in. high and 11 ft. 4 in. wide at floor level. Behind it stretches a cavernous cargo hold which, with three side-loaded lower-deck compartments, will swallow 100 tons of payload. What is more, a new completely-automated freight handling system built into the aircraft enables only two men to stow the lot in half an hour. By comparison, it takes the same time to load a maximum of 30 tons on a Boeing 707-320C freighter.

To make the most efficient use of the 747F, Lufthansa has produced its own freight container, 10 ft. long, 8 ft. square, with a maximum payload of 14,120 lb. and a cargo volume of 583 cu. ft. But the aircraft will take any standard pallets, igloos or containers up to 40 ft. long, as well as the biggest jet engines, motor cars or anything else that travels by air nowadays. Even the middle lower-deck hold is spacious enough to house four

Heading Photo, the new Boeing 747F is elegant for a cargo carrier.
Below, a 747F loading demonstration.
Left, the MSA 707 with "Superjet look" of a wide bodied jet.



medium-size family cars at the same time as other packages.

Looking at the vast row of containers, cars and other freight in the picture opposite, it is difficult to believe that it will all pack into the aircraft at the far end of the line. What adds to the deception, of course, is the fact that the 747F's main hold is wide enough to take 8-ft. loads side-by-side. As cargo reaches the nose-door sill, it is steered by the loading manager, who operates the master control station, to the right or left "lane" inside the fuselage. The containers, igloos and pallets are propelled by rubber-tyred drive-wheels, over rollers, casters and rails built into the floor of the hold, until they reach their assigned places. The power for this comes from the aircraft's own electrical ground power system, although external power, or even manual handling, can be used if necessary.

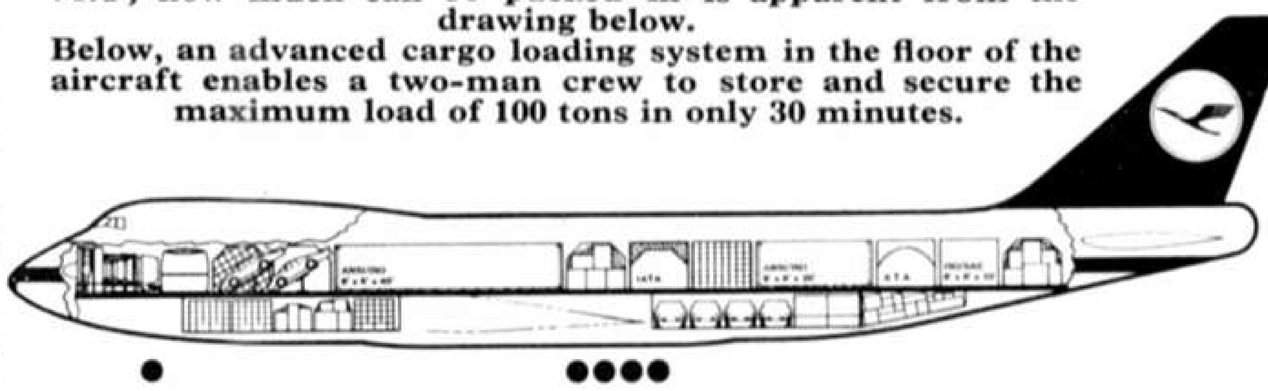
Once a load has reached its correct position, the drive-wheels are retracted, allowing it to settle firmly and be locked in place.

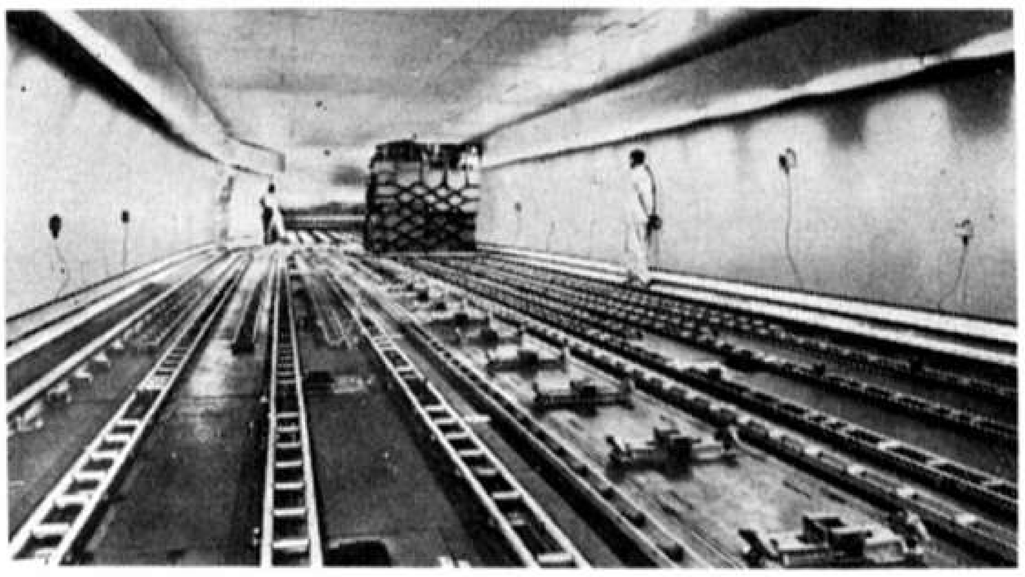
One of the big advantages offered by the 747F is that it makes possible real door-to-door delivery of air cargoes. The containers it carried can be transhipped on to any of the standard road, rail or sea transporters at each end, avoiding all need for costly and time-consuming break-down of loads.

This first Jumbo freighter will be used initially to replace two 707s on Lufthansa's transatlantic service between Frankfurt and New York, with a frequency of six return flights per week. If, as expected, it brings a major increase in freight flown over this route, other 747F's and other routes will follow. The scope is limitless. Already Lufthansa flies cargoes to more than 100 cities in 64 countries on six continents, and the headline on one of its advertisements in North America comments: "If we don't fly there, maybe there's no such place!"

Above, palletised cargo is loaded through the nose of the 747F; how much can be packed in is apparent from the drawing below.

Below, an advanced cargo loading system in the floor of the aircraft enables a two-man crew to store and secure the maximum load of 100 tons in only 30 minutes.





Molt Taylor's Coot

Moulton B. (Molt) Taylor has long been recognised as one of the most imaginative designers outside America's "main-stream" aircraft industry. For more than 20 years he has been developing, testing and trying to market a flying motor car which, unlike most others, is both good aeroplane and good road vehicle. Hampered by the heartbreaking task of competing with the world's most successful lightplane manufacturers, he has now diverted a little of his considerable energy to designing and building a small two-seat amphibian named the Coot which can be home-built and flown by amateur constructor-pilots.

In fact there are two slightly different Coots. First to fly, in 1969, was the prototype Coot-B with a twin-boom, twin-fin tail unit. Coot-A, illustrated on this page, is similar except for its more conventional rear fuselage and single tail-fin and rudder. Almost any engine in the 100–150 h.p. bracket can be fitted. The original Coot-B has a 125 h.p. Continental C125 "flat-four" in the pusher-pod atop a pylon aft of its enclosed cabin. The first two Coot-A's built by Aerocar have a 125 h.p. Franklin Sport 4R in a similar installation.

Wing span of the Coot-A is 36 ft., length 22 ft. and take-off weight 1,850 lb. It will cruise at up to 120 m.p.h. and needs only 12 seconds to unstick from smooth water. Would-be owners can make life easier for themselves by buying from Aerocar a number of completed components, including the glass-fibre engine cowlings, glass-fibre hull shell, fore-deck, instrument panel, tail fairings, engine cooling-fan blades and spring steel main undercarriage legs, as well as sets of plans.

Most of the remaining structure is of wood, and the unique "float-wing" design makes wingtip floats unnecessary. The closeness of the wings to the water also creates a "ground cushion" of air, making possible very low landing and take-off speeds without the need for flaps or other lift-enhancing devices.

Flying through the Freeze . . . 1

Before any airliner can qualify for a certificate of airworthiness, it must demonstrate its ability to cope with the worst kinds of weather likely to be encountered in service. For that reason, a Lockheed TriStar recently headed north from the warmer skies of California in search of the kind of weather that would give its anti-icing systems a thorough work-out.

The flight test crew found what they were seeking during 24 hours of battling through freezing weather over the U.S. and Canadian Pacific coasts, up to Alaska. During some of the time the ice-protection system was switched off deliberately, and technicians on board watched two inches of ice build up on the wings and tail, by means of a specially-installed closed-circuit television system.

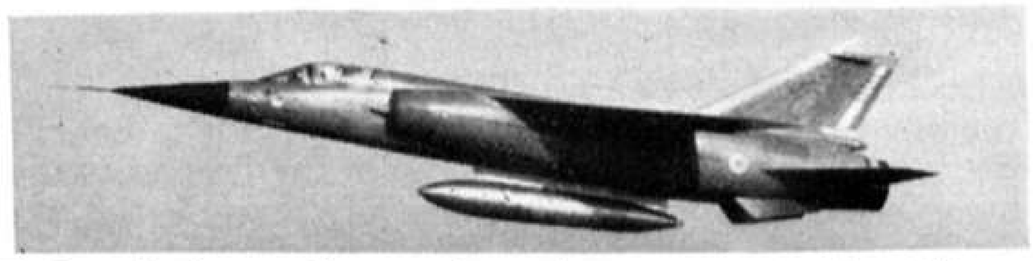
One TV camera was trained on the intake of the Rolls-

Molt Taylor's COOT-A prototype has a 12 second water take-off at 1850 lbs. gross. at S.L. with fixed pitch prop

Royce RB.211 turbofan engine mounted in the TriStar's tail. It left no doubt of the efficiency of the anti-icing system which protects the engine intake by circulating hot air ducted from the engine. Similar ducts protect the underwing engine intakes and the wing leading-edges.

Flying through the Freeze . . . 2

Another Lockheed transport aircraft went to the rescue of the ice-bound village of Kotzebue (population 700) when the 1971–72 freeze came unexpectedly early to the Alaskan coast on the Chukchi Sea, north of the Arctic circle. The ice-plugged channel leading to the village forced back barges carrying winter food, fuel and other supplies, compelling the sea-going craft to unload their vital cargoes at Nome, to the south. The only possible way in to Kotzebue—a fishing settlement and outpost for oil and mining exploration—was by air. So a Hercules freighter of Alaska Airlines was rushed to Nome, from where it hauled 500 tons to the isolated settlement in 18 flights. It returned later to give Santa Claus a hand by airlifting special Christmas holiday cargoes into Kotzebue.



Left and above, pictures show the new swept wing Mirage F1-C in flight.

More Moon Shots

News that a series of Moon shots had been reported from Phnom Penh, in Cambodia, came as quite a surprise. The cost of the Apollo man-on-the-Moon programme clearly rules out such activity for small nations, but these particular Moon shots were of a very different kind.

According to ancient Cambodian legend, a giant frog named Reahou makes periodical attempts to eat the Moon and must be stopped. So, on the last day of January, hundreds of Cambodian troops opened fire at the Moon, to prevent its eclipse by the mythical monster. Two people were killed and nearly 50 injured by the spent bullets.

Dassault's New Mirage

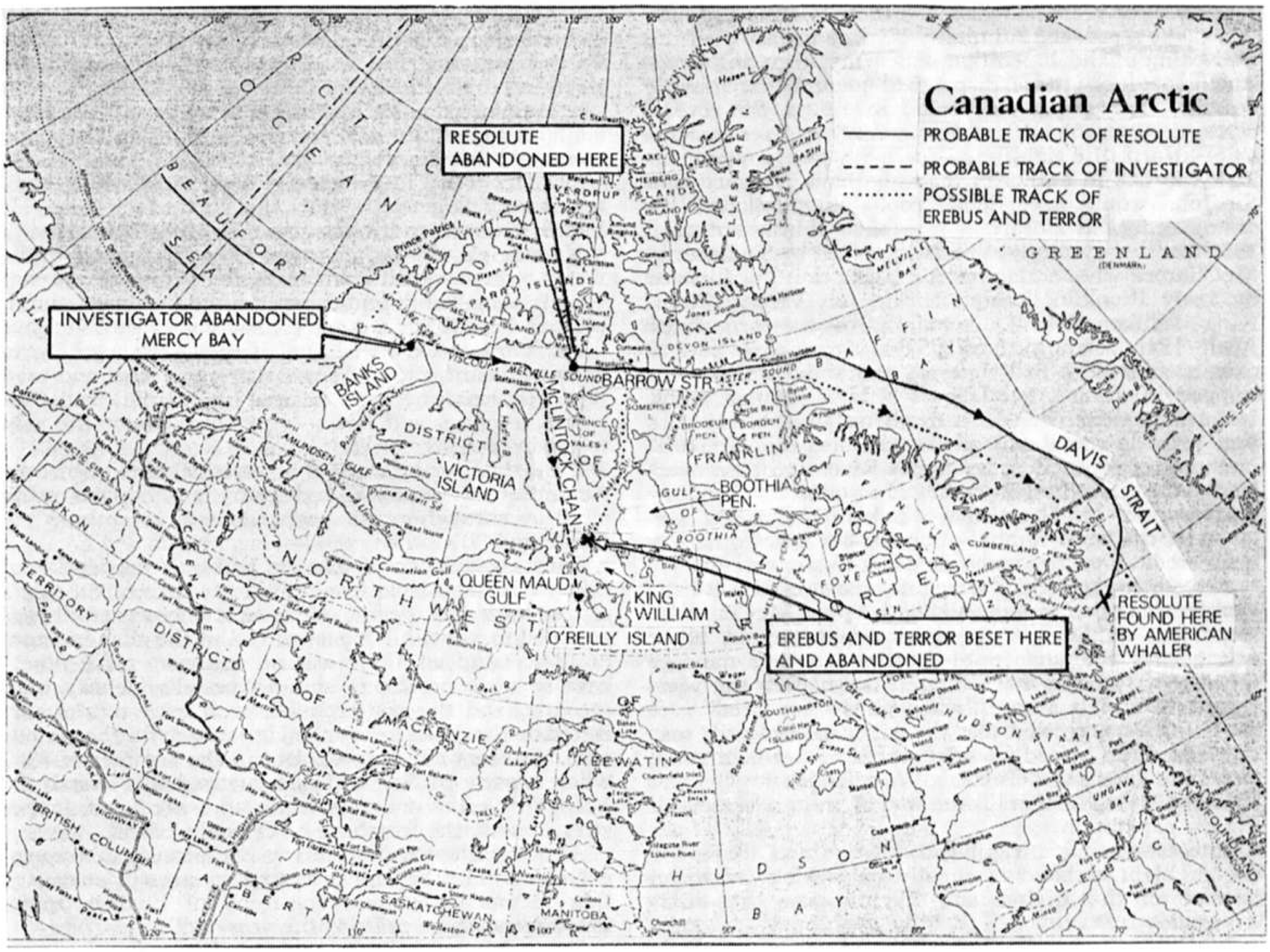
Dassault's delta-wing Mirage III fighter has been one of the major money-earners of the French aircraft industry since the war, equipping, with the similar Mirage 5, about 14 air forces. To replace it, Dassault have developed the new swept-wing Mirage F1-C, with 40 per cent greater fuel capacity, 22 per cent lower approach speed, 28 per cent better take-off performance and 80 per cent improved manoeuvrability.

The Mirage F1-C is a single-seater, spanning 27 ft. $6\frac{3}{4}$ in., with a length of 49 ft. $2\frac{1}{2}$ in., maximum take-off weight of 32,850 lb., and top speed of 1,450 m.p.h. (Mach 2.2) at high altitude. Powered by a 15,800 lb. thrust SNECMA Atar 09K-50 afterburning turbojet in its initial form, it will also fly safely at Mach 1.2 at low level, and take off and land in 700 yards when operated as an interceptor.

Typical armament for this role includes two 30 mm cannon built into its fuselage, two big Matra R.530 air-to-air missiles on underwing pylons, two wingtip-mounted Sidewinder missiles, and either a 264-gallon fuel tank or another R.530 under the fuselage. As a ground attack fighter, this load can be exchanged for 8,820 lb. of bombs, air-to-ground rockets, napalm tanks, an AS.30 air-to-surface missile or a Martel missile which homes automatically on enemy radars.

One prototype and three pre-production Mirage F1's have flown so far. Eighty-five production F1-C's have been ordered for the French Air Force and are expected to enter service in the summer of 1973. Later aircraft will be fitted with 18,645 lb. thrust SNECMA M53 Super Atar engines, raising the maximum speed to Mach 2.5. (*continued on page* 196)

These shots depict the small wingspan and armament of the Mirage F1-C.



W. C. McKenzie tells the strange tale of

The Disappearing Ships

TO anyone other than a Hibernian the name of O'Reilly Island must seem prosaic indeed, yet for a thousand years or more this tiny arctic isle, one of the many hundreds dotting the Queen Maud Gulf, played a vital role in the lives of the Eskimos inhabiting that vast region. During the spring of the year, when sunny weather and longer days bring joy to the hearts of all mankind alike, the natives habitually congregated there to hunt the great bearded seals whose tough hides they so highly prized and while the adults were busy with the hunt the children frolicked at their games, enjoying each transient moment to the fullest. It was a land of plenty where they could live out their simple lives in peace and happiness—the world forgetting and by the world forgot—until the white man intervened in the person of Sir John Franklin, the Arctic navigator.

In the mid-nineteenth century Franklin's name was familiar to every household in Britain and America, yet the passage of time has dimmed his many important exploits and he is now principally remembered for his dramatic and extraordinary disappearance. The steps leading up to this incident had their beginning several centuries before when Frobisher, Baffin, Davis, Hudson, James, Parry and Ross had all attempted without success to find the elusive Northwest Passage.

In the early 19th century, both Parry and Ross had assayed the long east/west channel which stretches across the high arctic but neither could find a navigable route between the encircling islands and until this was found there was no way of reaching the relatively ice-free waters (during the summer months) along the northern coast of the mainland. Franklin himself had made some remarkable small boat voyages along the coast, yet the fact remained that no one had found a route through the almost impenetrable field of ice which surrounds the islands of the Central Arctic from the Beaufort Sea to King William Island and the Boothia Peninsula. Once this link was forged the North-west Passage would be a reality and, hopefully, a commercial route between Europe and the Orient.

Anxious to achieve this goal, the British Admiralty decided to equip one final expedition and to ensure the success of the venture placed its most trusted officer Sir John Franklin in command. On May 19th, 1845, he sailed in H.M. Ships Erebus and Terror, ex-bomb vessels already famed for their recent Antarctic voyage under Ross. They were last seen in Melville Bay off the western coast of Greenland by the whaler Enterprise and following this chance meeting, ships and crews apparently vanished from the oceans, never to be viewed again by civilized man.

After three years had passed without hearing so much as a single word, the Admiralty became uneasy over the well-being of the expedition and many ships and overland expeditions were dispatched to seek the missing vessels. Traversing the Arctic in relays for several years, they examined just about every quarter imaginable—except the right one—for, with true government logic, no one in authority seems to have reasoned that Sir John would have, in all probability, followed his sailing orders as closely as possible. It was not until 1859 that the mystery was partially solved by Sir Leopold McClintock who, acting upon a suggestion put forward by Lady Franklin, located a cairn on Victory Point, King William Island, containing a message dated April 1848 relating that 105 survivors (out of 129 officers and men) had deserted the ships which were trapped in the ice, five leagues N.N.W. of that point. It further noted Franklin's death on June 11, 1847, a year prior to the abandonment and also the survivors' intention of proceeding up Back's River and then overland to the doubtful safety of the Hudson's Bay Company trading post on Great Slave Lake. No reason was given for the large number of deaths but it has generally been credited to that much dreaded disease scurvy.

Since many questions were left unanswered it is little wonder that other searchers have followed McClintock's steps for, quixotic as the goal might appear, there was always the chance of locating another message (persistent rumours have filtered down over the years regarding burials ashore "when guns were fired" and these stories suggested that the expedition records may also have been buried for safekeeping in a cement vault. For more details see Canada's Western Arctic (Queen's Printer 1931) to further lift the aura of mystery surrounding the expedition.

Interesting and intriguing as that subject might be, the problem at hand is equally perplexing: whatever became of the Erebus and Terror after they were deserted?

McClintock was the first of the searchers to obtain intelligence of the ships, or to be more precise a single ship, when he fell in with a native family on the Boothia Peninsula who were aware of a mysterious vessel having recently sunk in the vicinity of O'Reilly Island.

The most detailed account of the incident is the one obtained by Charles Frances Hall, an American adventurer who devoted a considerable portion of his remarkable lifetime attempting to solve the Franklin mystery. In 1869 he located an Eskimo, living near King William Island, by the name of Innookpoosheejook who remembered the occurrence well and freely related the following tale:

> "The ships had four boats hanging at the sides and another was above the quarterdeck. The ice about the ship one winter's make; all a smooth floe. A plank was found from the ship's side down to the ice".
>
> "Gathering into an Igloo my interpreters Joe and Jake with Innookpooshejook, and putting before the last named native McClintock's chart, he readily pointed out the place where the Franklin ship sank. It was very near O'Reilly Island, a little eastward of the north end of said island, between it and Wilmot and Crampton Bay. A native of the island first saw the ship when sealing; it was far off seaward, beset in the ice. He concluded to make his way to it, though at first he felt afraid; got aboard, but saw no one, although from every appearance somebody had been living there. At last he ventured to steal a knife, and made off as fast as he could to his home; but on showing the Innuits (the Eskimos pridefully call themselves Innuits, meaning The People, whereas the word eskimo is an English corruption of a French corruption of a Cree Indian word meaning "eaters of raw flesh". The Eskimo retaliated effectively by dubbing the Indian an adlit or louse's egg), what he had stolen the men of the place all started off to the ship. To get into the igloo (cabin), they knocked a hole through because it was locked. They found there a dead man, whose body was very large and heavy, his teeth very long. It took five men to lift this giant Kobluna (white man). He was left where they found him. One place in the ship, where a great many things were found, was very dark; they had to find things there by feeling around. Guns were there and a great many very good buckets and boxes. On my asking if they saw anything to eat on board, the reply was there was meat and tood noo in cans, the meat fat and like pemmican. The sails, rigging, and boats—everything about the ship was in complete order."

This, then, is the story in all essential detail heard by Amundsen, Rasmussen and many others who made inquiries throughout the years, some as recently as the 1920's and 30's.

Since the Eskimo of that era had little conception of time, it is impossible to pinpoint the date of the ship's arrival with any degree of accuracy, however, it was assumed to be within a year or two of the abandonment in 1848. Indeed, there was no reason to think otherwise or question the mysterious vessel's identity until recently, and the matter might well have comfortably rested on that basis forever had it not been for the curious turn of events which took place in the summer of 1967 when a party of Scuba divers engaged in a search for Franklin's relics found several large sheets of copper strewn along the foreshore of O'Reilly Island.

Although the wreck itself was not located, subsequent examination of the copper by experts strongly suggested that it was underwater sheathing of English origin, dated somewhere prior to the year 1850.

Yet neither the Erebus or the Terror were copper sheathed!

What, then was her identity?

For some years now Rear-Admiral Wright R.N. (Retired), author and Jutland veteran, has clung to the theory that the wreck is that of H.M.S. Investigator, (this historic vessel and her crew are credited with the discovery of the Northwest Passage) abandoned in 1853 in Bay of Mercy, Banks Island while engaged in the Franklin search. Although a number of ships were abandoned during this search, Investigator was the only one in any position—remote as it might be—to drift to O'Reilly Island, and she was copperbottomed against the teredo, that troublesome borer which attacks wooden vessels in the tropics.

Wright's principal argument is built around the "corpse" found by the Eskimo when the derelict ship was boarded. He reasons that it would be illogical for the Franklin crews to have left a body behind, particularly one requiring five men to lift, since they were alleged to have been starving to death. He theorizes that the "corpse" was in reality the ship's figurehead, but unfortunately the builders' records of Investigator are no longer extant. Luckily, a lynx-eyed correspondent located a detailed description in an old magazine and, as it turned out, the figurehead depicted a walrus, which certainly goes a long way toward explaining the story of the Kobluna with the long teeth. Neither the Erebus or Terror, the only other ships to visit the area, had a figurehead as such—just a large scroll—so the inhabitants, never having seen one before, would be hard pressed to find an equivalent word in their language.

To return to the copper, one thing is certain, it must have come from the wreck for no wood was attached to carry it to that remote beach, although strips of what appeared to be caulking were still adhering to the inner surface. The water at O'Reilly is shallow and a reasonable guess might be that ice peeled off the pieces while passing over the wreck, ultimately depositing them where they were found by the divers. The journal of the Investigator's interpreter mentions just such an incident when wood and sheathing were "torn from her sides and remained hanging from the ice-blocks" and also gives a clue to the dimensions of the copper when it records that "a copper sheet on the ship's side measuring 36 inches by 13 inches was grazed and folded back so that it was only 9 inches long". The captain's journal refers to the copper being crumpled "as if it had been paper". All of these descriptions reasonably tally with the specimens.

The strongest evidence, albeit negative, in favour of Investigator is that obtained by that much under-rated servant of the Hudson's Bay Company, Dr. John Rae. Six years after the abandonment of the two vessels, while on one of his memorable treks near King William Island, he met a small band of Eskimos, among them Hall's informant Innookpoosheejook, who had not heard of any wreck at that time (1854), although he was aware of white men having died in the vicinity. Both Hall and Rae were impressed with this man and regarded him as being very intelligent. Rae also noted a decided paucity of wooden articles in the possession of the natives and this would be an unlikely state of affairs if they had successfully looted a ship. Wood pillaged from the wreck would have been to the Eskimos as manna to the Israelites and the only logical conclusion is that the vessel had not yet made its mysterious appearance and that the events related to Hall by the Eskimo with the unpronounceable name in 1869 occurred sometime after 1854.

Although abandoned in 1853, Investigator was seen once again in 1854 when a sledge party attached to the rescuing squadron visited Mercy Bay to check her condition. She had been well buttoned up at the time of her desertion and a year later was still in a reasonable state, although heeled over about 10 deg. and down slightly by the head. It would certainly take a lot of punishment to sink Investigator, as she was double-planked as a precautionary measure before leaving for the north. Prior to reaching Mercy Bay, her captain tried to take on ballast and had piled about fifty tons of rock ashore for this purpose, however, before it could be brought aboard there was an unexpected shifting of the ice and Investigator involuntarily moved with it—sans ballast. In addition to her lack of ballast there was also the fact that her coal supply was depleted by an additional two years' usage. When it was decided to abandon her, just about everything movable and usable was placed ashore to form a depot in the unlikely event any shipwrecked mariners were ever thrust upon that cheerless coast. She was very strong, of wooden construction, empty of all stores, low in ballast and for these reasons must have been buoyant in the extreme—in other words almost unsinkable.

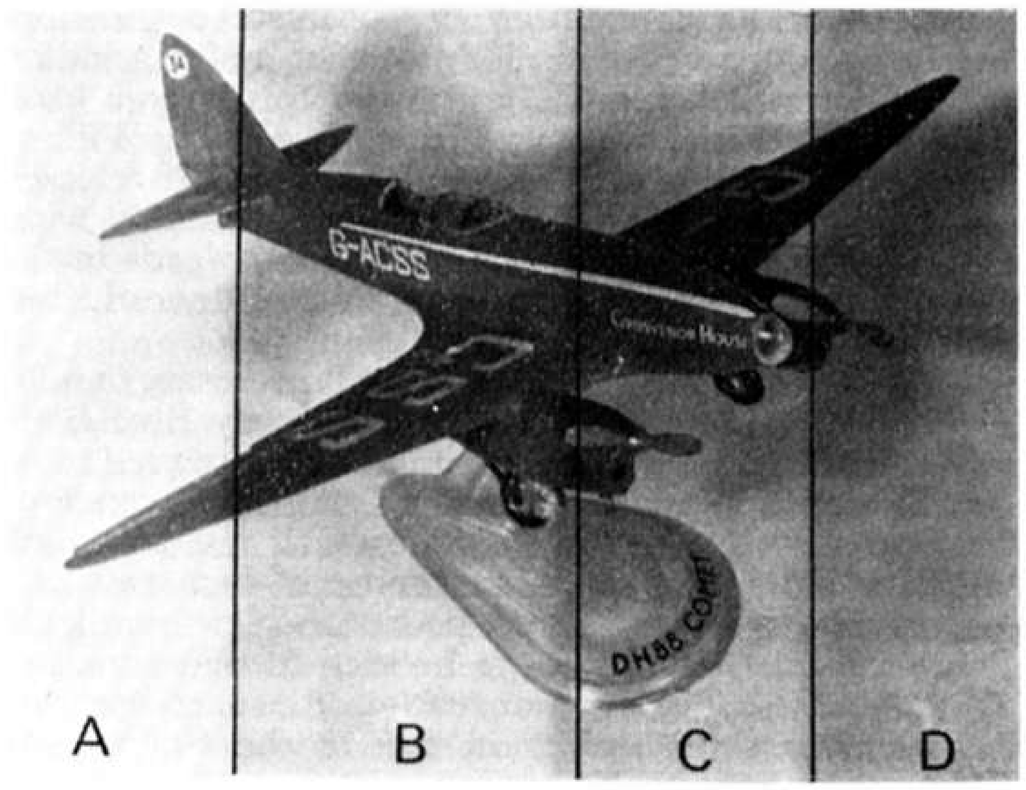
There are only two questions remaining unanswered and the first of these is whether Investigator would arrive at O'Reilly Island by the natural drift of the ice. It is a good question and no one can be entirely sure of the answer. However, if Investigator had poked her bow out of Mercy Bay she would have certainly drifted in an easterly direction. Before entering Mercy Bay, the captain and others noted the easterly set of the current in that locality. If the Investigator had drifted into the northern entrance to the McClintock Channel there can be little doubt of her ultimate destination, for she would be carried along in that awful grinding mass of ice which funnels southward to disgorge itself ultimately upon the north western coast of King William Island, the scene of the Franklin tragdey. If released anywhere near here she would almost inevitably wind up in the vicinity of O'Reilly, all of which leads to the second question—if the wreck is that of Investigator, whatever happened to Franklin's ships?

To answer this question partially it is necessary to refer to that august authority, the Parliamentary Blue Book published "in reference to certain vessels observed in an iceberg in the North Atlantic in 1851". It concerns the English brig, the Renovation, which was travelling from Ireland to Canada when some of her crew and passengers observed a large floe near Newfoundland. There are many such floes to be seen in that area, but what made the incident unusual was the fact that two three-masted ships similar in size to the Erebus and Terror were seen to be resting on this particular floe. Although carefully observed by several persons for some time through a telescope, no sign of life was apparent and no attempt was made to board. Since then, many persons have tried to discredit the veracity of the viewers, however the investigating officer, Captain Erasmus Ommaney, R.N., an experienced seaman and not likely to be misled, concluded his report thusly: "that two vessels were seen in the position described there seems to be no shadow of a doubt". It was suggested that they were probably abandoned whalers and the Admiralty therefore made every effort to determine if any such ships were missing but none were. In any event, they were unlikely to be whalers as whalers never travelled in pairs for the obvious reason that it halved the catch.

It is not at all certain that the Erebus and the Terror could have drifted northward to Barrow Strait in an unmanned condition and then eastward to the Atlantic (there is a precedent, H.M.S. Resolute, of the squadron that rescued the Investigators, subsequently abandoned in Barrow Strait was later found in a seaworthy condition by an American whaler drifting in the Davis Strait, a matter of 1200 miles away) yet the spot where they were trapped will, during a freak summer, divest itself entirely of ice and is it not possible that some of the retreating crews returned to the ships, liberated them and then proceeded northward under sail or steam power—such as it was—later becoming trapped in a more accessable location and finally yielding to scurvy, disease or climate or a combination thereof?

During the spring of the year a few of the present generation of eskimos still return to O'Reilly Island, to enjoy the sunny weather and engage in their humble pursuits. It is just a fleeting visit now and the only real signs of human visitation are the faint traces of ancient campsites which dot the landscape and the occasional bit of flotsam from the wreck reluctantly given up by the sea.

Is it the Erebus or Terror that lies in her icy tomb near O'Reilly Island, or is it the final resting place of the equally historic Investigator, borne through that maze of ice and islands by the vagaries of the ocean currents like the Flying Dutchman? Has the mystery of the "corpse" which took five men to lift been adequately answered or was it really the body of a crew member, perhaps Franklin himself? Will the identity of the wreck ever be established? Until such time, I am afraid, as some devotees of the Snorkel and Scuba apply their unusual energies to the problem and follow it to a logical conclusion these questions, like many others pertaining to the Arctic, must remain unanswered.

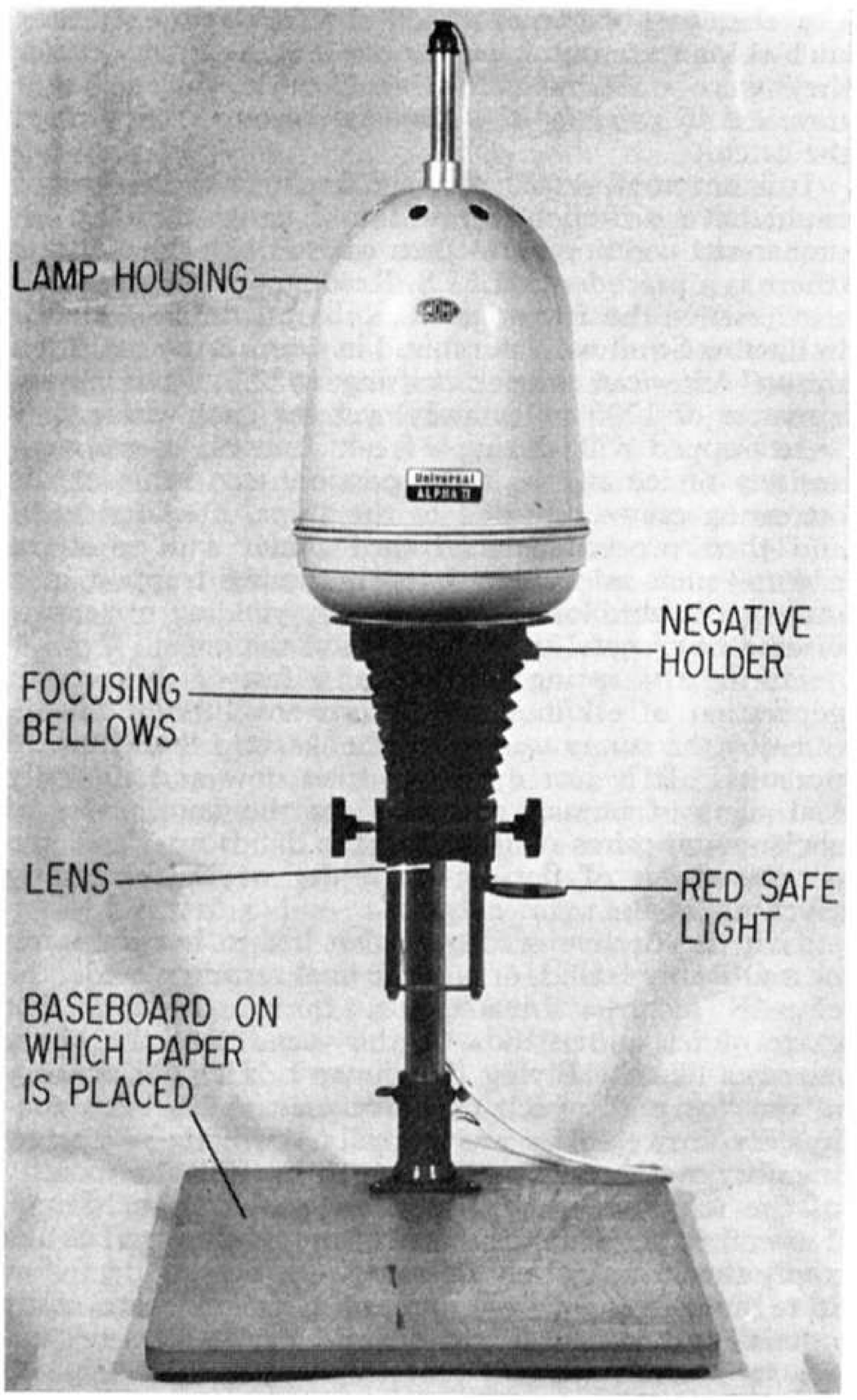


PHOTOGRAPHY IS EASY

No. 6

ENLARGING

BY PETER WILKES



ANYONE who has ever visited a photographic exhibition and gazed at the beautifully enlarged photographs that line the walls will know that here is the whole reason for photography in black and white. It is this end product in the photographic process that represents the ultimate visual expression of the scene that first attracted you with your camera, and until you have experienced the thrill that can only come from making your own enlargements, you have failed to appreciate the immense satisfaction that photography as a hobby can give you.

The process of enlarging, like many others in the photographic chain of production has, in the past, been cloaked by mystery. To many the whole thing is complicated and difficult—all right for those prepared to devote hours of study to the subject, but not for those who want a hobby that is free of the tedium of book work.

Nothing, however, could be further from the truth. Enlarging, and the production of enlargements of exhibition quality, is as easy as the first taking of the scene with the camera, and there is absolutely no reason why any beginner should not, from the very outset, produce prints that have the quality of professional work.

At the heart of the enlarging process is the enlarger itself, whose function will be better appreciated if we first consider what we are setting out to do when we enlarge a negative.

The process of enlargement is, in fact, one of projection.

We are projecting the small negative onto a piece of sensitive paper, of a size equal to the finished print we require and, after we have given it an exposure, in just the same way as we give an exposure to the film in the camera, we develop it, use a stop bath and then fix it in a similar manner to the photographic process used in the production of a negative.

An enlarger consists of a lamp housing a condenser beneath the lamp to pin-point the light through the negative, a negative carrier that fits below the condenser, and a lens fitted, usually, on a bellows unit, so that the image from the negative can be focused onto the sensitive paper.

The whole is fitted onto a vertical column in such a way that it can be moved up or down, so that the size of the projected image is always under the control of the photographer.

As well as the enlarger, three dishes, one size larger than the largest paper size you are likely to use, are required, together with a plastic measure, thermometer and a safe light.

Enlarging paper has the peculiarity that, although if exposed to normal light it would be ruined, it is not sensitive to reds or greens. In consequence the enlarging process is carried out under a lamp called a "safelight" and which consists of an ordinary electric light bulb in a casing, into which different coloured screens can be fitted. For enlarging purposes the best colour to use is olive green. This gives adequate illumination in which to work and the light itself does not falsify the tones in the enlargements.

Printing paper comes in various sizes and surface finishes. The surface used is, in many respects, a matter of personal likes.

Prints intended for reproduction are always made on a white glossy surface, but for exhibition work the most popular are the fine grained or rough lustre finishes. Any photographic dealer will show you prints made on the various paper surfaces available and from these you can select that which appeals to you personally.

Manufacturers have assisted the production of perfect enlargements by making paper available in three basic grades—soft, normal and hard.

For a negative of an ordinary subject that carries a full range of tones, a normal grade of paper is used, and in practice it will be found that this grade is suitable for over 95% of your work, but it is a comforting thought that, for the odd 5% of negatives, the other grades are there.

A soft paper would be used for a negative of a contrasty subject. For example, a white building, on a beach lit by brilliant sun would give a negative of such contrast that a normal paper would not be able to accommodate all the tones, but a soft paper would give a greater tonal range in the final print.

A hard paper is available for those subjects that lack contrast. Flat frontal lighting giving an overall soft effect would require a hard paper for printing.

Photographic paper, just as film in a camera, requires the correct exposure for perfect results but, whereas the makers can give exposure tables with a film, this is not possible with enlarging paper.

The procedure, however, to obtain perfect exposure is not difficult.

A negative is put in the carrier on the enlarger, the unit moved up or down the column until the required image size is obtained, and the picture focused by the fine focus control. This is done with a piece of ordinary white paper under the enlarger. After this the red "safelight" which is fitted under the lens of the enlarger is moved across the lens and a piece of photographic paper removed from its container and placed on the enlarger baseboard.

All focusing is done with the lens at its largest "f" stop, but this is then put down two or three stops.

The enlarger is switched off, a piece of card slightly larger than the paper being used is placed over all but one inch of that paper.

The enlarger is then switched on for three seconds, switched off, and the card moved to allow treatment to another inch of the photographic paper.

Repeating this procedure gives a piece of paper that has been exposed in steps of three seconds for possibly ten times.

The paper is then placed in the dish of developer and the dish agitated by a slight up and down motion so that the developer is kept moving over the paper.

Print quality comes from development. Print quality, to rouse comment and amazement at any exhibition, is easy, *provided the photographic paper is allowed to develop to finality.* A safe rule, in practice, is to allow the paper to develop for half a minute more than the time recommended by the makers of the developer in their instructions.

A print that has been developed to finality is easy to recognise. The blacks are pure black, not the insipid grey of a print that has been hastily snatched from the developer because too much exposure was given and it was getting dark.

After development to finality, a rinse in the stop bath and fixing, the test strip can be examined under normal lighting conditions and the correct exposure selected.

Using this method results, from the first attempts, are bound to succeed.

The developers for enlarging, like those for the development of negatives, come either in concentrated bottles requiring to be diluted at a temperature of 68 degrees F in accordance with the instructions supplied by the makers, or as a powder to be dissolved before use.

For the beginner to enlarging, the easier kind are those that are diluted with water, used once and discarded.

Many people are deterred from enlarging their own negatives by the thought that a "dark room" with running water etc. is a necessity. Nothing could be further from the truth. A small cupboard whose door can be sealed against light leaks by means of a blanket is perfectly adequate as the finished prints can be put into a bucket of water until the session is over and then washed in bulk for the required twenty minutes under running water.

A bathroom is also suitable for use as a dark room if the windows are blacked out and the door sealed, as the enlarger and dishes can easily be dismantled after use and stored away until the next session.

The process of enlarging can indeed open new worlds to the amateur photographer, giving true satisfaction from a great hobby and, providing it is always remembered to DEVELOP TO FINALITY, give prints that are the equal of all and inferior to none.

Opposite page, above, showing the test strip procedure to find out exposure time when enlarging. The correct exposure time falls between sections "A" and "B". Give, in this case, one second more than the time used for "A". Below, an enlarger for amateur use.

Right, a print over-exposed and removed from the developer early. Note absence of true black and white tones as compared with the apparently identical scene at far right, which is from a print developed to finality.

THE MENACE OF THE GOODWIN SANDS

By Sam Napier

ENGINEERS are studying a plan to dig up the Goodwin Sands off the Kent Coast to provide materials for a land reclamation scheme. This will be good news for sailors, for these deadly sandbanks at the North Sea mouth of the Straits of Dover are among the most deadly traps for unwary seafarers.

In spite of all the aid scientific invention has been able to give the men of the sea, these sandbanks still claim their toll of wrecked and grounded ships; since the end of World War Two, millions of pounds worth of precious and essential cargoes have come to grief there. One American vessel filled with £125,000 worth of foodstuffs and general goods had her back broken to become a total wreck.

Extending for about ten miles north and south, these sandbanks cannot be measured accurately, as they are continually shifting. Roughly four miles wide, they lie about six miles off the coast of Kent opposite Sandwich and Deal.

Through the treacherous sands runs a channel called the Kellet Gut. This can be used as a short cut by some vessels seeking shelter in bad weather. Normally navigating this channel is tricky enough, but, in a fog or with a gale blowing or a ship in distress, the job becomes a seaman's nightmare. Particularly dangerous is the North Sea entrance—one of the busiest sea routes in western waters. The shifting quicksands defy the skill of all but the most experienced local pilots.

Disturbing too is the fact that little can be done to remove this threat to shipping. Explosives are useless, for the shallowness extends all round the actual sandbanks.

This great natural obstacle stands as one of the most dangerous areas to shipping in the whole Seven Seas. For centuries it has claimed six vessels, on the average, aground each year. In spite of every possible precaution shipwrecks there cannot be avoided. Even the guidance of many years of experience in the nearby waters cannot guarantee safety.

In past years ships of many nationalities have foundered on the Goodwins. Perhaps the gravest menace from the sands lies in the fact that at low tide parts of them are exposed. They are firm, but as the sea covers them they become loose. Because of this, ships which run into them are usually stuck fast. Buffeting about by a heavy gale then does untold damage to the vessels, and vessels stranded on the sands often end up in such a position that only lifeboats can reach them. Only as the tide rises can they successfully manage to tow them to safety.

Fogs and gales increase the dangers of the quicksands. One hides the markings that surround the shoals, while the other, as well as tossing the vessels about dangerously, also moves the sands.

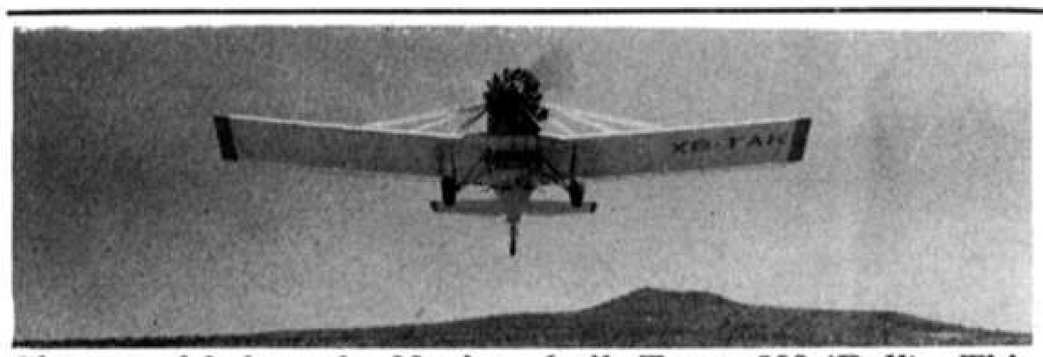
The Goodwin Sands have a terrible history of death and destruction. For almost 1000 years they have lured ships to their wrecking and men to their doom. The sands hold the remains of many adventurers and sailors of every age.

At one time the sands were a little island called Lomea. Then—one terrible night—the wild sea surged over the island submerging it. In terror those inhabitants who could, fled to the mainland leaving their possessions behind them. Many of them were trapped and drowned. During the centuries since this catastrophe, the earth and soil has been turned into shifting sands by the tides. And even since a process of disintegration has been going on with the shoals becoming "loose" and ever more menacing. At low tide it is possible to walk upon the sands, for they are then four or five feet above water. But at high tide, some 15 feet submerged, they form a trap for ships.

In the winter and early spring business is always brisk for the lifeboat crews who keep watch upon the Goodwins. Although lightships mark the extreme limits of the Sands (and not so long ago the South Goodwin was torn from her moorings and ended up on her side on a sand bar) and numerous buoys, signals and fog guns give warnings, the Sands still claim their victims. From time to time the Admiralty prepares new and more elaborate charts of the area. But even these cannot save the ships. Gales which sweep down on the shipping just off the Sands carry the vessels aground, leaving captain and crew almost helpless.

The new plan will involve taking nearly 400,000 cubic yards of material from the sandbanks to fill in seven acres, and it will all form part of a giant re-construction scheme costing £2.5 million. The dig to remove the sand may well turn up treasures, for the Sands have, for centuries, been the graveyard of hundreds of ships, many carrying valuable cargoes.

Thus in removing one hazard from the shipping lanes a new and better harbour at Dover will be built. But even 400,000 cubic yards of sand removed will still leave the Goodwins treacherous.



Above and below, the Mexican built Tauro 300 (Bull). This plane accepts either a 300 or 350 h.p. Jacobs R-755 radial engine.

AIR NEWS (continued from page 190)

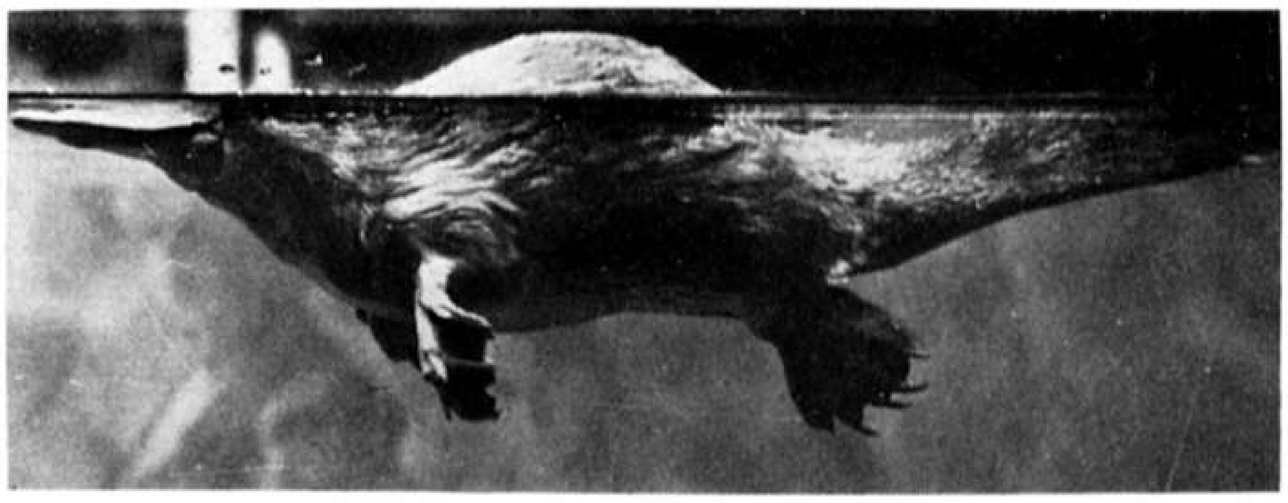
Anahuac Aggie

For those who don't know (which included me) Anahuac is the name of the former Aztec valley where Mexico City now stands. It is also the name of a new aircraft particularly suited to that country's needs.

First product of the company is a single-seat agricultural monoplane named the Tauro 300 (Bull). The prototype has been flying since December 3, 1968; the first production machine followed on June 5, 1970, and the type is now in production with alternative 300 or 350 h.p. Jacobs R-755 radial engine. Construction is all-metal, except for fabric covering on the wings and tail unit. The chemical hopper, forward of the cabin holds 1,764 lb. of dry chemical or 175 gallons of liquid.

The Tauro 300 is quite large, with a span of 35 ft. 6½ in., length of 26 ft. 11¼ in. and loaded weight of 3,542 lb. Top speed is 120 m.p.h. and normal operating speed 85 m.p.h. A two-seat training version is under development, and there seems little doubt that Anahuac S.A. has kicked off with a pretty impressive first design.

A living link between mammal, bird, fish, and reptile — the mysterious monotreme



The Platypus

By Frank Madigan

THE monotremes of Australia, which are the platypus and the echidna, have always aroused the curiosity of scientists since they were discovered by settlers in the 1790's.

The platypus, apart from its fantastic appearance, which actually caused many people at first to regard specimens as stitched-up fakes, was reported by aborigines to be an egg-laying mammal. This was the subject of argument for many years; in fact, it was not until the 1880's that it was really proved that the platypus did in fact lay eggs.

In 1884 a scientist, William Hay Caldwell, while studying this very subject, found a platypus on the banks of the Burnett River in Queensland. He dissected it, after noticing that it had laid one egg, and found that it had been about to lay another. This proved his theory that monotremes are egg-layers, and the eggs they lay contain yolk, which is used as food for the developing embryo.

Caldwell, very excited at his proof, sent a telegram to the British Association for the Advancement of Science, which was meeting at that time at Montreal. His message read "Monotremes oviparous, ovum meroblastic", which was only stating a fact that the aborigines had always known, but one which the white men was sceptical about.

Scientists consider that the Australian monotremes, as they are classified, fit in between the higher mammals and the reptiles, as far as their brain, skeleton, metabolism and reproductory systems are concerned.

The platypus is the better known, having a bill like a duck and webbed feet, yet its body is more like that of an otter, its tail like that of a beaver, and it is equipped with claws for digging.

It is, in fact, a living link with mammals, birds, fishes and reptiles, known to scientists as an oviparous amphibian mammal, one of the most primitive creatures left on earth today.

It is classified as a mammal, as the female feeds her young with milk—through the pores of the skin, as she has no teats; yet, the mother broods like a bird, sleeping for two weeks after she has laid her eggs. She curls her flat tail around them until they are hatched. The reproductive organs are similar to those of a reptile, and the heart to that of a mammal.

Fully grown, the platypus varies in length from fifteen to twenty inches, the head terminating in the quaint duck bill, which gives the animal its vernacular name.

It is possible to grasp a handful of skin and barely touch the body beneath. Shading from dark brown on top to creamy-grey below, the fur has a rich sheen, which costs many thousands of animals their lives. This fur gives it perfect camouflage against its natural background of creeks and rivers, where it hunts its food under water, shutting its eyes and ears before diving, and staying under water only for a few minutes at a time while foraging, either early morning or late evening. This creature always avoids direct sunlight.

The platypus feeds on tadpoles, freshwater shrimps, worms and small fishes, storing the food until it surfaces, when it swims around masticating.

Another interesting point, peculiar to the monotremes, is that the males have poison spurs on their ankles and, in the case of platypus specially, most efficient ones. Almost every year there is a report of an incautious fisherman catching a platypus, trying to release it, and being poisoned for his trouble. Often the victim needs attention in hospital for a few days, but the poison is not fatal.

The burrows of the platypus are of two kinds—there is one for general living purposes, occupied by males or females separately, and then there is a more elaborate nesting burrow, which the female uses alone when laying her eggs and rearing her young.

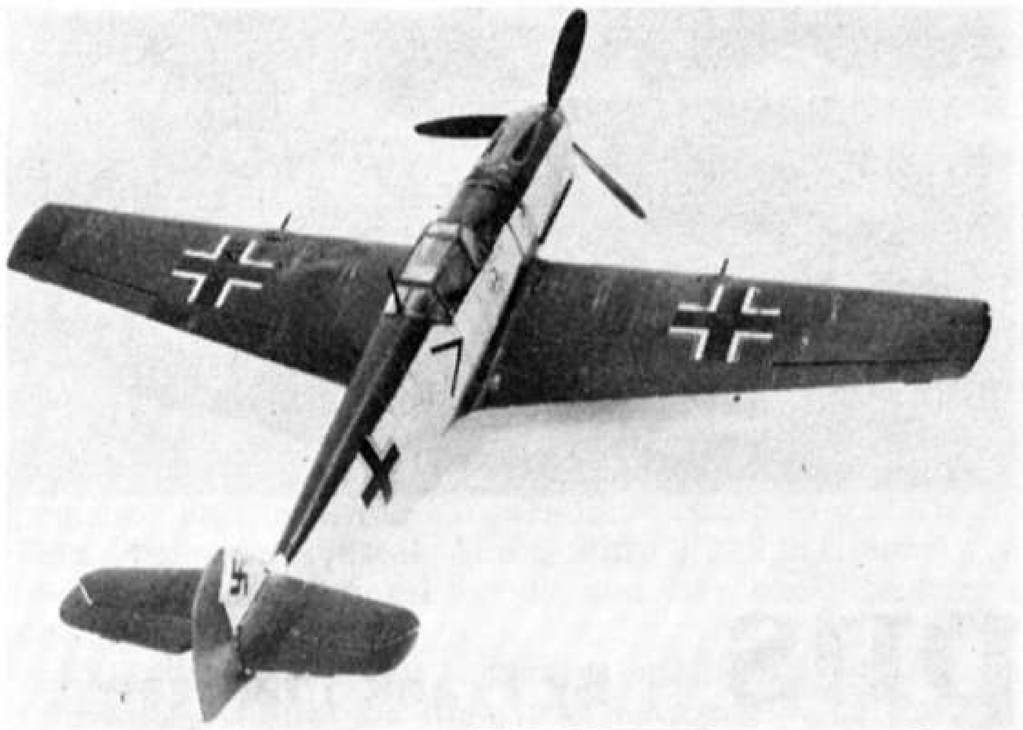
According to the well known naturalist, Ellis Troughton, . . . "The low-arched breeding tunnel roughly conforms to the body, the length of the burrow averages from 15 to 60 feet, the average distance underground is 15 inches, and, contrary to popular belief, the entrance is above water—normally 4 to 12 feet above it—the occasional under-water one being the result of a change in the water level. The nests may be constructed of grass and gum-leaves, thin willow switches, or reeds frayed out by the animals' jaws".

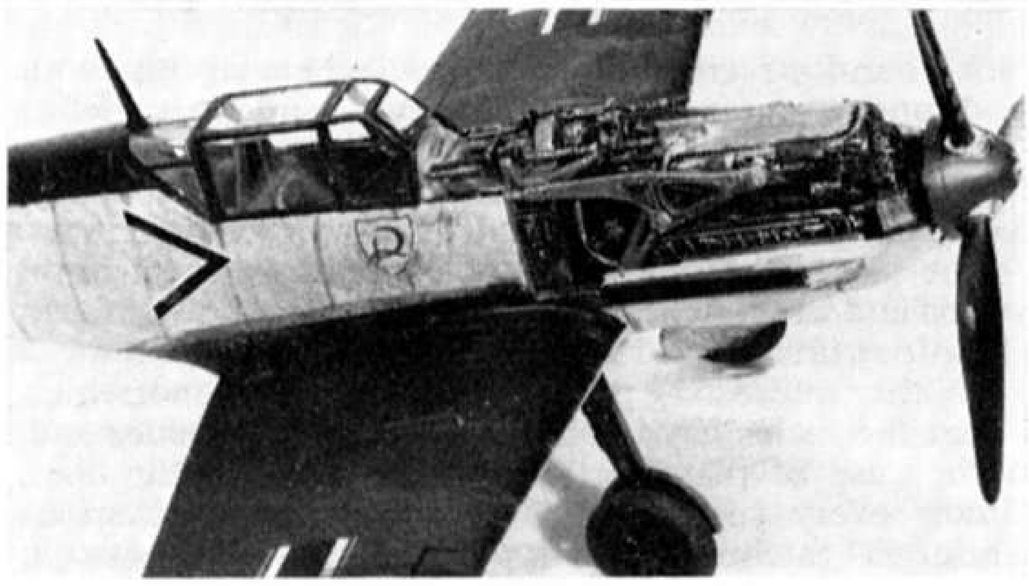
Even the name of this weird creature is peculiar for, strictly speaking, it does not belong to it at all! Six years before a wood boring beetle of America had been christened 'Platypus', and an International Convention had ordained that no two living creatures must bear the same name.

In 1798, Sir Jospeh Banks, who went to Australia with Captain Cook, sent a specimen of the Australian mammal to Dr. George Shaw of the British Museum. Dr. Shaw, unaware of the existence of the American beetle, promptly named this amazing creature, 'Platypus'.

By the time the error was discovered, this unusual animal had so intrigued the public fancy that the scientists resolved it would be a pity to change its name. They distinguished the two by spelling the Australian mammal with a small 'p'.

Fully protected now by the Australian Government, it seems that this weird creature—mammal, bird or reptile—will live on till the end of time, mocking by its appearance, habits and even its name, the customary rules of nature and of mankind.





Above, Airfix's 1/24 scale Messerschmitt 109E (U.K. Price £2.25) is complete in almost every detail, having movable flaps, wheels, opening canopy and removable cowling which reveals the detailed engine.

Below, four more new Airfix kits; running in a clockwise direction, the De Havilland Beaver, 1/32 Porsche 917, the Mustang, new 1/24 scale aircraft as seen at the Brighton Toy Fair shortly to be released, and lastly H.M.S. Manxman.

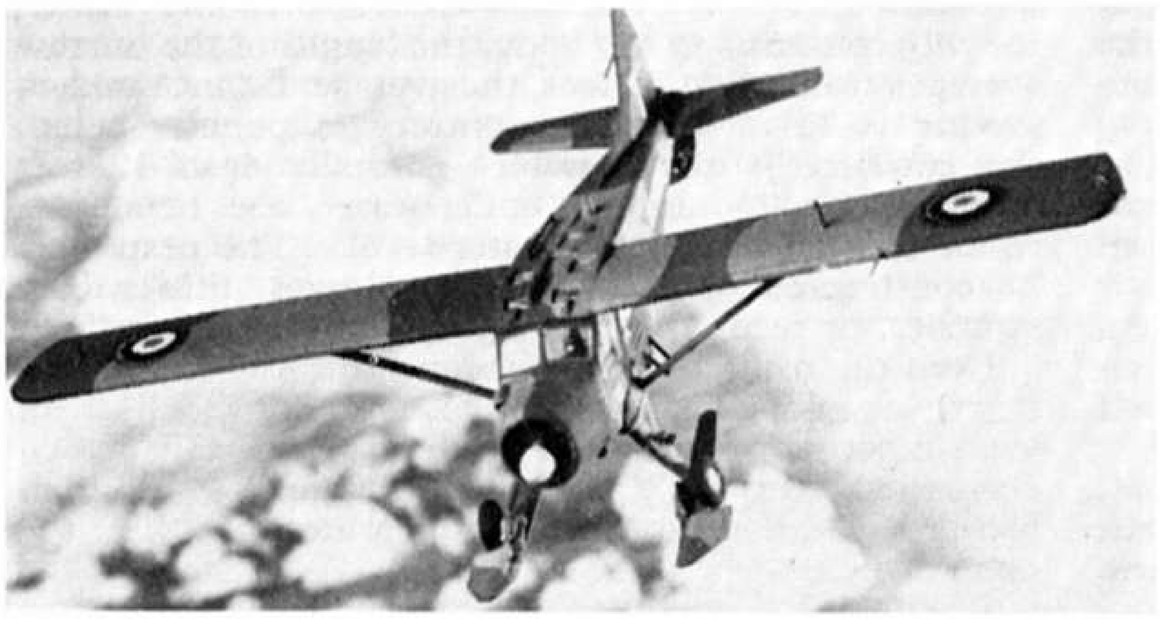
Have You Seen?

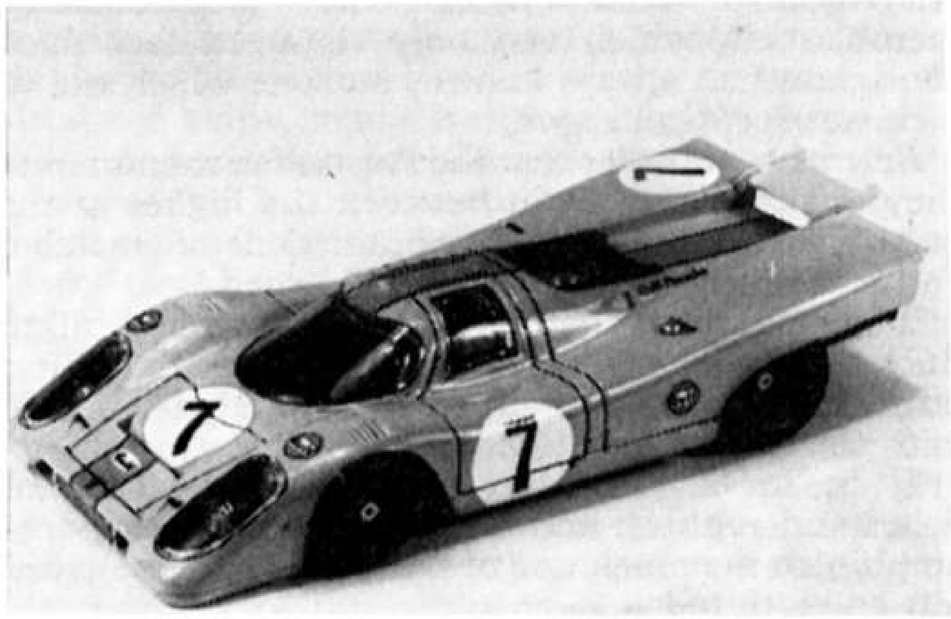
THE latest "Matchbox" releases this month consist of three "sporty" looking cars. No. 66 is the Mazda RX500 which has a chromium plated interior, purple tinted windscreen and plated engine, the latter revealed via an opening boot. The body is finished in an orange ochre while the underbody has been sprayed in white.

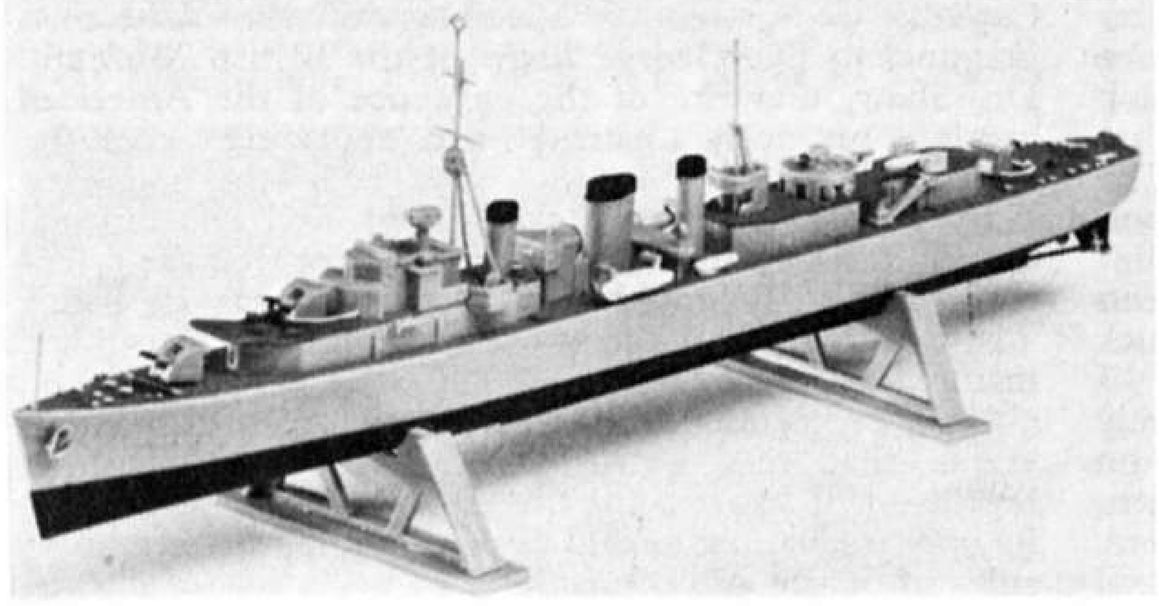
No. 61 is a fictional car called Blue Shark, having a bright metallic blue paint job and an exposed V-8 dragster engine. The last of the current releases in No. 60, the Lotus Super Seven finished in a bright yellow and is fitted with Superfast wheels as are all the models. The three models retail at 16p each.

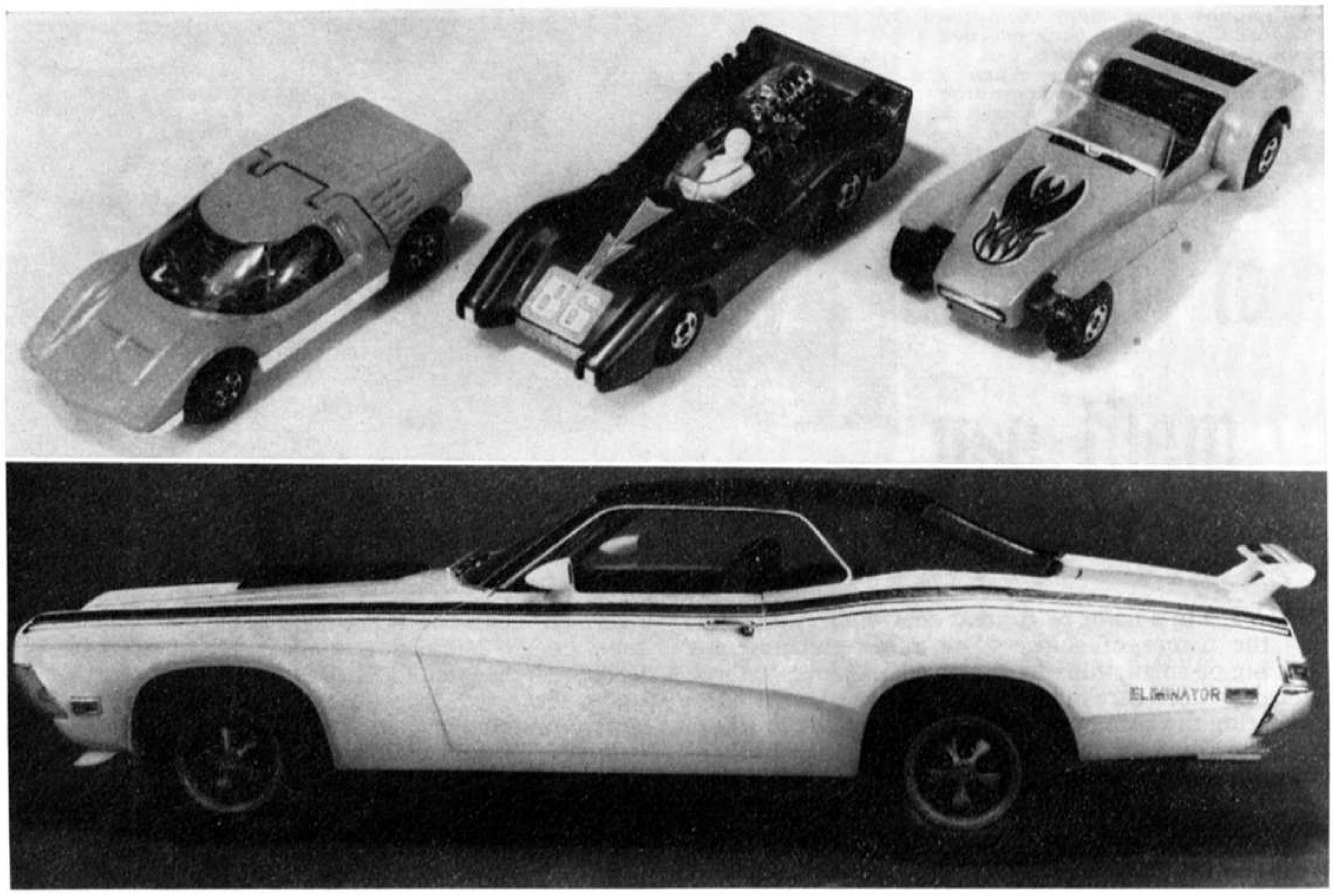
The Nakamura 1/20th scale Mercury Cougar (imported by Richard Kohnstam Ltd.) contains about 180 parts which go to make up an authentic looking model of the 1970 Mercury Cougar standard, XR-7 or Elimination versions. The kit includes die-cast wheels, suspension and engine block into which fits a small electric motor, driving the rear wheels via a gearbox, prop shaft and rear axle. The plastic parts are finished in white, black, brown, clear, chrome and transparent red. Among the working features on this kit are working headlights, reclining seats, steerable front wheels, opening doors, bonnet and boot, the latter containing two HP7 batteries that power the lights and motor. The roof of the car has a sprayed matt black vinyl effect moulded into it. Although it is rather highly priced at £6.99, it is an excellent kit with well fitting parts.

The Airfix 1/32 scale model of the Gulf Porsche 917 has 65 parts and when completed is 5½ in. long. A finely-sculptured model of a racing driver is included and this together with the interior should be painted before cementing into position beneath the aerodynamically shaped body, which has been moulded, in white polystyrene and is accurately finished including









At the top are the three new Matchbox cars which sport brightly coloured paint and Superfast wheels. Below them is the expensive Nakamura Cougar in 1/20 scale imported by Richard Kohnstam.

such fine detail as air intake louvres and filler caps. Windscreen, windows and lights are all supplied in preformed, transparent plastic and the instruction leaflet should be followed closely when fitting these parts.

The transfer sheet, although good, is lacking in white discs, numbers and two Gulf stickers, which should be positioned just above the headlights. The colour blue on the box is wrong and should be paler; the nearest colour available is Humbrol Sky Blue. Apart from this, the kit is extremely accurate for the size. Our model is of the car that won the Manufacturers Championship in 1970 and 1971 and is as raced in the 1971 BOAC 1000 km race at Brands Hatch, driven by Jackie Oliver and the late Pedro Rodriguez. The price of this kit is a very moderate 25p.

The De Havilland Beaver has been described as one of the most versatile aircraft in the world and it is able to operate on wheels, skis or floats. The 1/72 scale Airfix kit of this famous aircraft (U.K. price 35p) includes parts for any of the three variants and transfers for either British or U.S. Army identification. The kit has 94 parts and when completed the overall measurements of the model are a 5 in. fuselage with a wingspan of 8 in. The skis and floats, communications antennae, air intakes, landing lights, step rails, etc. are all finely-detailed.

Over 1600 Beavers have been built since the aircraft first flew in 1947 and the plane is still widely used today in communications and casualty evacuation roles. The aircraft was initially designed as a bush float plane and large quantities were purchased by both the United States Army and Air Force. The British Army Air Corps currently operates 42 Beavers and Civil operators in more than 40 countries operate the aircraft in a variety of roles from air taxi work to aerial surveys.

The aircraft has a maximum speed of 160 mph at 5,000 feet and has a larger than average wingspan. A particularly unusual feature is the series of four portholes immediately above the cockpit. In the kit the Pratt and Whitney engine has been carefully reproduced, the propeller rotates and a full set of painting instructions is included in the pack.

H.M.S. Manxman is the latest kit in a series of famous World War II ships to 1/600 scale from Airfix (U.K. price 25p). This scale model of this 40 knot cruiser-minelayer has 86 parts and is 8¼ in. long.

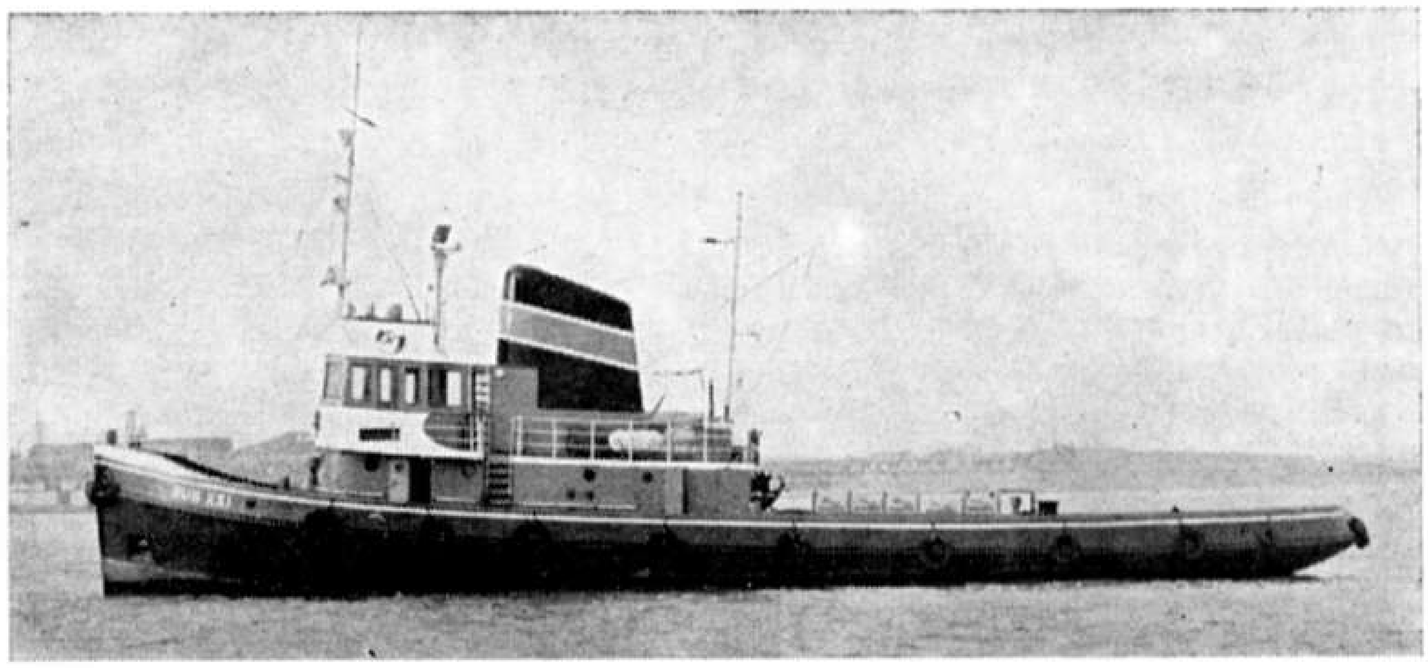
The first stage in assembling the grey polystyrene construction kit is to fix the pre-moulded main deck on to the hull. Next the intricate superstructure which contains over 30 parts is cemented and set aside to dry before the other deck detail is placed in position.

The Manxman carries heavy AA armament and modellers will notice that particular care has been taken in reproducing the battery of guns which consisted of six 4.7 inch, four 2 pounder AA, eight 5 inch, four 4 inch AA, four 40 mm AA and 12.20 mm AA.

The ship, which during the war survived the hazards of the Malta run with essential equipment and supplies, has a top speed of 40 knots on the 72,000 s.h.p. developed by her two-shaft geared turbines, and on the model the propeller shafts, screws and rudder are accurately reproduced. H.M.S. Manxman could carry 156 mines and the kit contains all the original deck detail including lifeboats, detection and communications equipment, minelaying apparatus, twin anchors and chains; even the portholes and hatches are clearly defined.

The Airfix kit contains painting instructions and a display stand is available so that the completed model can be shown to its best advantage.

Though many ships carry the same name, usually one has sunk or been broken up before another can be registered in that name. When a fleet like the Sun Tugs uses a common name, each craft has to carry a distinguishing number. This is Sun XXI; we believe that the latest is Sun XXVIII.



Naming a Ship

BY EDYTH HARPER

WHAT'S in a name? A great deal when it concerns the names of ships. The name given to any vessel, big or small, adds to its appeal and 'personality'. Such names need care in choosing. No one knows if the ship bearing the name will sail on its appointed journeys almost unknown to the world or if by some freak of fortune, it will go down in history. The *Mayflower*, Admiral Nelson's *Victory*, and the *Mary Celeste* are known to millions while such names as the *Pride of Boston* may sail for a score of years unnoticed.

Naturally each nationality, in naming its shipping, turns first to its own history and culture. The *Ile de France*, *Bretagne*, and *Jeanne d' Arc* slip in and out of French ports. German harbours are accustomed to the *Bremen*, *Siegfried*, and *Kaiser Wilhelm*. America delves into the past to name the *George Washington*, *Texas Ranger* and *United States*, but all American ships have their origin, as far as names go, way back in Anglo-Saxon history.

The *Mayflower* brought with her more than a band of men and women dedicated to the task of building a new way of life. She also linked future American shipping with a fleet of named ships that had long since sailed for the last time.

Angol-Saxon records show that the Saxon King Edgar (959–975 AD) certainly laid the foundations of a navy. King Alfred also owned a fleet of ships but important as they were, chroniclers of the period mention no names, either of trading vessels or fighting ships.

The first authentic record would appear to be William the Conqueror's *Mora*, the vessel in which he sailed on his voyage across the Channel to conquer England. Another known name was a 'great ship' owned by Henry III who called her *The Queen*, possibly as a compliment to his consort. This forerunner of the Cunard liners of today appears to be the earliest, if not the first truly British ship to be known by name.

In the 15th century, it became the custom to bestow names connected with religion on ships. Three of Henry V's ships, also chronicled as 'great ships' were called *Jesu*, *Trinity* and *Holigost*. Shortly afterwards Henry started a custom prevalent among some shipping companies today. Just as the Canadian Pacific Company ships were "Empress of . . . " so Henry's new vessels all had names in '*of the Tower*', referring to the Tower of London. His *Jesus of the Tower* was 1000 tons, quite large for those days. The carracks, ballingers and barges, lesser merchant vessels, go unmentioned by name although the King subsidised the owners to the tune of £8,240.17.6 a quarter for their upkeep, so important was trade to Britain.

By the time America was re-discovered in Tudor times, most ships seem to have been well and truly named. Drake's *Golden Hind* and the *Santa Maria* of Columbus sailed into the history books. By the 19th century even small boats had names. Pleasure seekers on holiday by the sea had the choice of a row round the bay in the *Mary Ann* or the *Abraham Lincoln*. The Mississippi steam boats, the ferries and the fishing vessels all had their names duly painted on them.

The romance of the tea-clippers was undoubtedly heightened by their attractive names. The famous American clippers *Lightning* and *Flying Cloud* raced home with precious cargoes, followed in later years by the *Cutty Sark* and *Friar Tuck* from Britain.

Explorers such as Nansen and Capt. Scott brought tales of the *Fram* and *Discovery* into every household. Disaster at sea fortunately rarely happens but when a tragedy such as the loss of the *Lusitania* occurs, the world never forgets the ship's name. Even small craft can become famous. Thor Heyerdahl's balsa raft, the *Kon-Tiki* is as well known for his voyage to Easter Island as many an ocean liner.

The sea is rarely romantic to those whose business it is to sail on it but in the names of the ships they sail in, men do find an outlet for their imagination. It will be a long time, if ever, before all ships are classified by name or number.

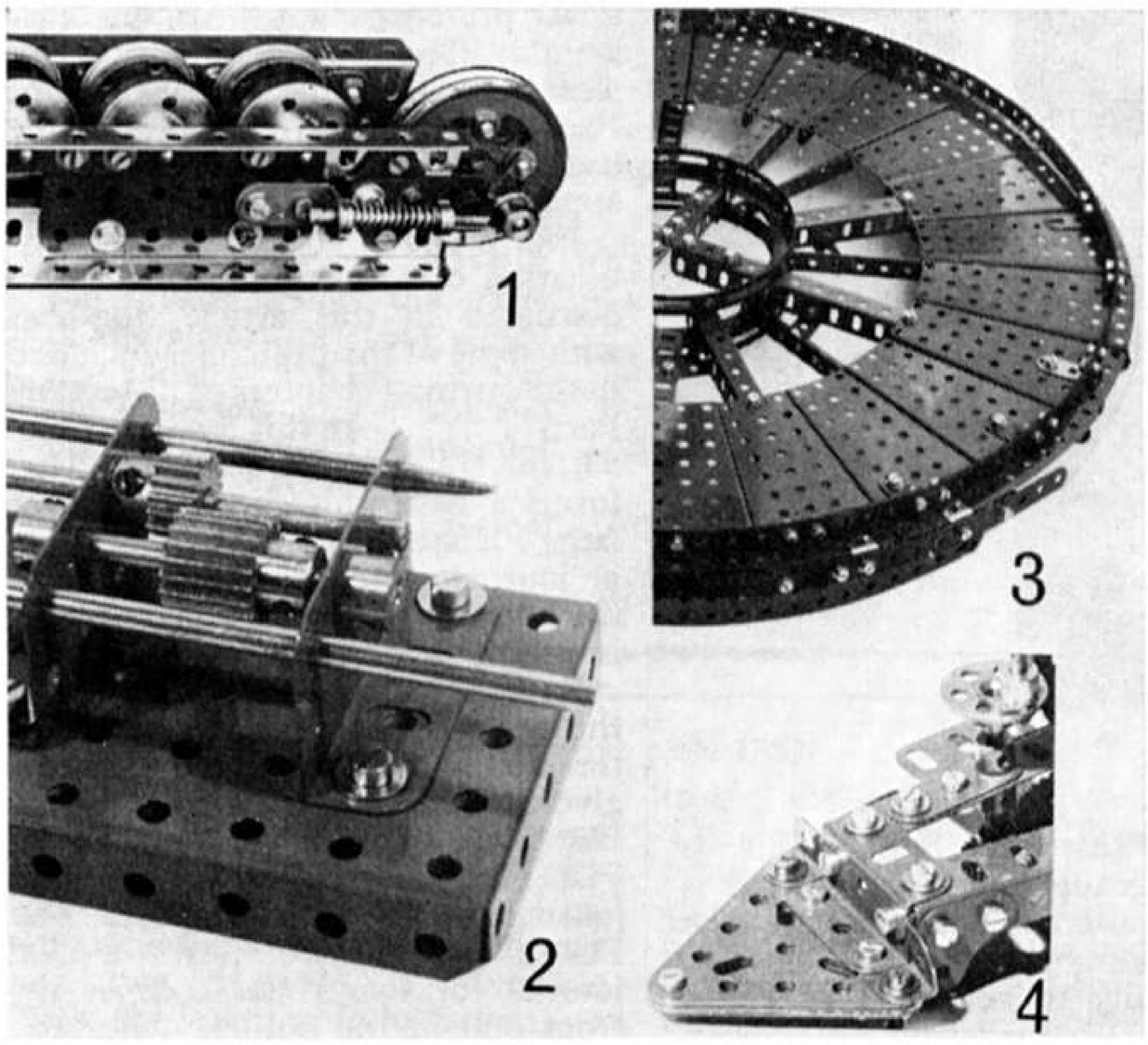
Which would you prefer? To book a cruise in the XY/ABC or voyage to sunnier climes in the *Belle of New York*? All things being equal, the latter would probably have the longer passenger list.

We may never know who first named an Anglo-Saxon ship, but one thing we can be sure of—she had a nickname.

It is an old custom sailors bestow on anything they like.

The "Lizzie" may sound disrespectful for the *Queen Elizabeth*, but it shows affection. Possibly even Henry III's *Queen* was called "The Nelly" after his consort, Eleanor of Provence—strictly in private, of course, for disrespect for the Crown soon petered out in a dungeon in those days.

Each age sees its own type of ship and produces its own name to suit. So long as there is a sea to sail on and a ship to voyage in, mankind will think up a name for one of the oldest forms of travel in the world.



Meccano Parts and how to use them

Part 4 — Plates

By B. N. Love

So far in this series we have considered Strips and Girders, together with the means of fastening them together to form the 'skeleton' of a model structure. In many cases, the lattice construction resulting is adequate for bridges, towers, crane jibs etc., but in a majority of models some kind of plating is required to add rigidity or to cover in unwanted open spaces and to provide, at the same time, journals for running shafts and anchoring points for other parts of the model.

Two basic forms of rigid Plates are provided in the Meccano system, namely, Flat Plates and Flanged Plates. The latter adopt the same principle for rigid edges as that used in the manufacture of Angle Girders, i.e. the edges of the Plates are folded over at Right Angles. Most common of the Flanged Plates is the $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate which has been included in virtually every Meccano Outfit since the birth of the system in 1901. It even featured in the pre-Second World War OOO Outfit! Choice of $5\frac{1}{2} \times 2\frac{1}{2}$ in. dimensions proved to be very acceptable from the outset for this particular Flanged Plate, which has featured as the baseplate in many thousands of different models. Flat Plates are often required where a Flanged Plate would prove awkward to fit and to give Flat Plates some strength they are manufactured in a thicker gauge of steel. These items should not be confused with the Meccano Flexible Plates which are of much thinner material and which will be covered in a later part of the series.

An inspection of a list of Meccano Parts will show that Plates in general feature in two or three separate parts of the price list and to familiarise readers with the part numbers a table is shown here which includes a description of Meccano Plates, in order of size, with the part numbers shown in the final column. With such a range of perforated Plates, the constructor has a wide choice at his disposal and some of their applications are illustrated in the accompanying photographs.

Typical applications of Part No. 52 appear in Figs. 2, 5 and 6. Fig. 2 shows a common arrangement in which the Flanged Plate makes a general base for mounting journal brackets upon it in models requiring gear boxes etc. The surprising strength of the $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate is demonstrated by its use as the baseplate of a production tool, part of which is shown in Fig. 5. When fitted together, the tool will actually form short Meccano Strips into a special shape for caterpillar tracks and although the finished Strip is bent to a perfect shape each time, no distortion whatsoever occurs in the Flanged Plate. A $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate is also featured as part of the tool and its job is to hold four locating pins in the correct position when inserted through holes in the base Flanged Plate from below. Again, no distortion occurs in this Plate even after repeated use.

Perhaps the most interesting of the Flanged Plates is the Sector Plate, so called (quite correctly) because it forms part of the sector of a complete circle. It is very rarely featured in such a form because no less than 24 of them are required to complete a full circle! They are, nevertheless, supplied in all current Meccano Outfits from No. 5 upwards, the manuals for which show many applications of the Sector Plate. Models requiring tapered effects such as sand hoppers, car chassis, ships' decking etc., make good use of Part No. 54, but, for the record, Fig. 3 shows that the Sector Plate does match up in circular form and this part illustration shows how a very large base can be constructed for a really giant model of a dragline.

Of comparable interest in the Flat Plate section are the Triangular Plates, Part Nos. 76 and 77. Fig. 4 shows four of the $2\frac{1}{2}$ in. Triangular Plates bolted together to form the heavy spade trail of a Field Gun model and the slotted holes in this size of Plate are shown clearly. These add versatility to the Plate which may be used as the side journals of a winding mechanism for a winch etc., in which case the slotted holes permit the non-standard spacing of Meccano Gears which do not normally mesh together, such as the 1 in. Gear and the 15-teeth Pinion. As the 1 in. Gear has 38 teeth, the reduction ratio obtained is close to $2\frac{1}{2} : 1$ which makes a nice scale speed reduction. To locate the second shaft in such a winch, a Fishplate,

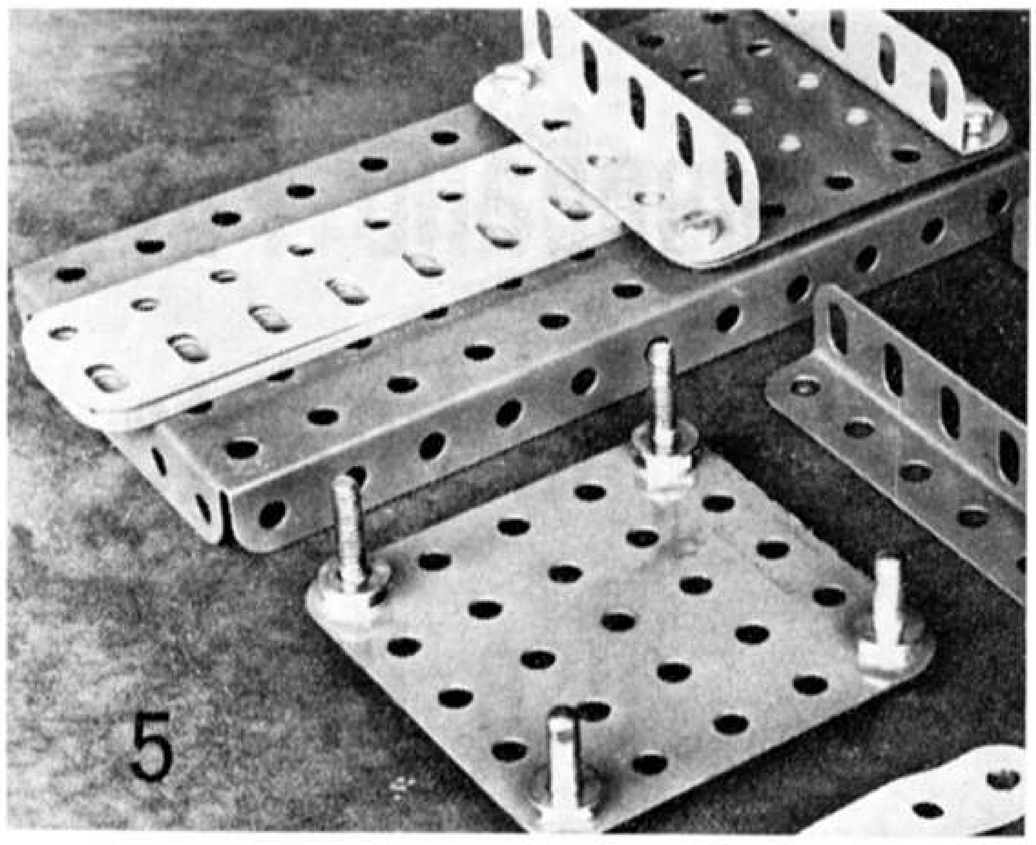


Fig. 5 shows a production tool for forming caterpillar track components. This and the other illustrations are all referred to in the text.

Part No. 10, would be bolted by its slotted hole to a corner hole of the Triangular Plate and its round hole would be set over the slot in the Triangular Plate to locate the Axle Rod in the required position for gear meshing.

Part No. 77 is the smallest three-holed Plate in the Meccano system, but it is also one of the most versatile. An equilaterial triangle with holes at ½ in. centre spacing is provided by the 1 in. Triangular Plate and one application of this part is shown in Fig. 1 where two of them are combined to make a 'diamond' plate. This allows a 2 in. Slotted Strip to be critically located in the side frame of an excavator base. Note also the use of the 3 × 1½ in. Flat Plate, Part No. 73, to hold the Girder members of the side frame and the number of anchoring points it provides for attachments.

Readers who have been following the series will have noticed the frequent appearance of Angle Girders (featured in Part 3) in the models illustrated here. This is simply because the Angle Girder is the natural complement to the Flat Plate, adding strength at the base and rigidity to vertical Flat Plates used as journal sides for gear boxes, crane cabs and general side plating. This continuous feature throughout this series shows the natural tie-up between the parts in the Meccano system so that, while it is impossible to feature a large number of applications of particular parts in a single Chapter, the series as a whole will show repeated examples of parts already discussed at a basic level.

There is of course, a whole family of other Meccano Plates known as Flexible and Strip Plates in rectangular form from 12½ in. in length down to 1½ in., but, generally speaking, they are perforated at their edges only, for attachment, and are not designed to act as journal plates, their job being to cover in model frameworks in the most economical manner with enhanced appearance of a non-perforated surface. The same principles apply to the Triangular Flexible Plates, the gauge of steel being the same as that used for Flexible Plates and examples of the use of all of these thinner plates will appear elsewhere in the series.

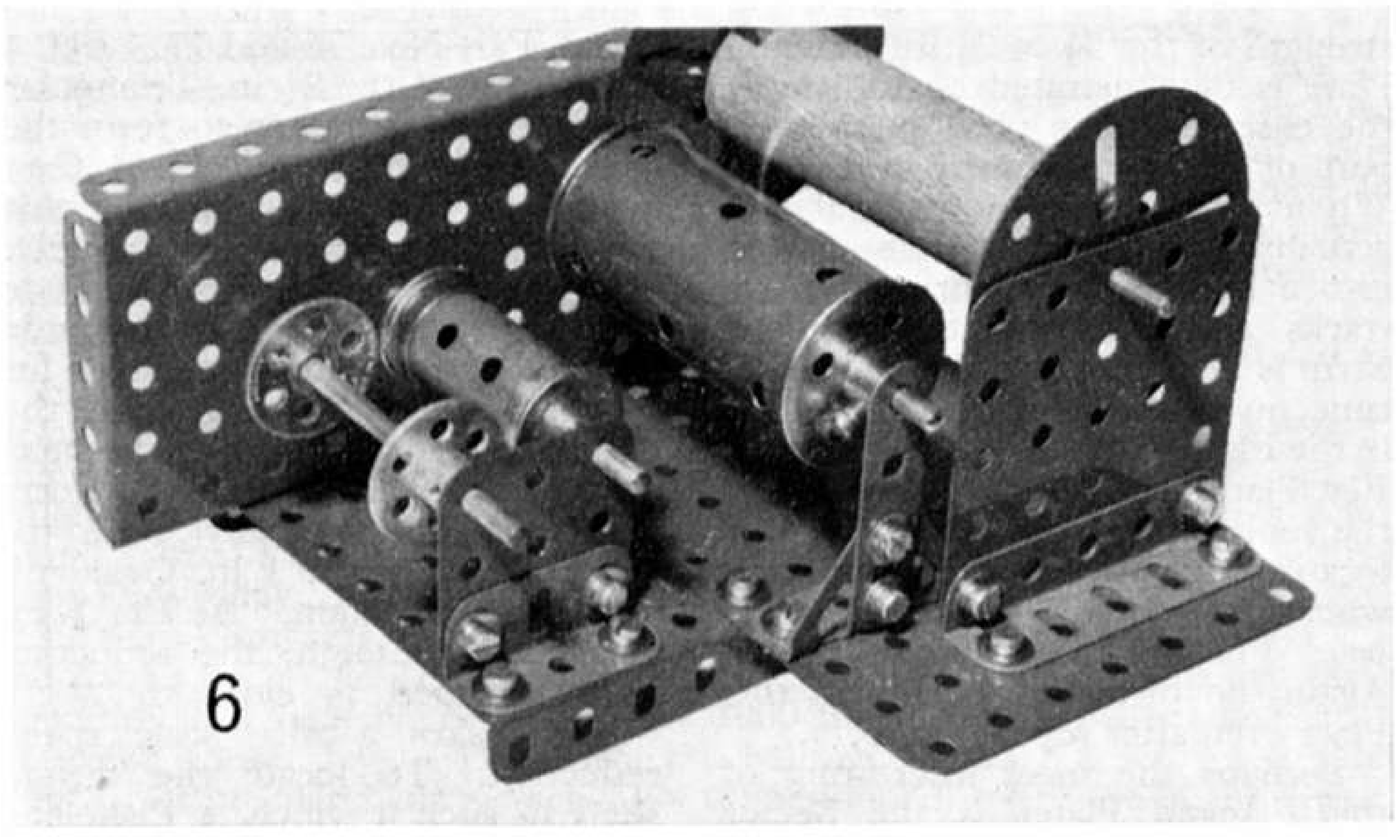


Fig. 6 shows an interesting combination of a number of the Plates discussed in this article, together with some of the principles included in the opening chapters of "Meccano Parts.....". In this case, Part No. 53, the 3½ × 2½ in. Flanged Plate, forms a base unit and the popular large Flanged Plate forms a bearing, or journal plate, for the far side of the model. This particular model is purely a demonstration unit for cylindrical parts so the near side of the model is 'cut-away' mechanically, for the sake of clarity. Width is given to the base by a 5½ × 3½ in. Flat Plate on which a 2½ × 2½ in. Flat Plate is erected for use as a journal plate. The smallest Flat Plate, Part No. 76, forms a neat journal for two Axle Rods at the front end of the model. Note the use of Angle Girders to support the vertical Flat Plates and the use of Washers under the Boltheads for added strength.

The use of Plates alone is not always sufficient for mechanical rigidity and constructors should bear this in mind, particularly if there is any side thrust occurring in the model. For instance, if any of the winding drums in Fig. 6 were subject to heavy side movement, the Flat Plates would not be sufficiently braced for this and additional brackets, set at right angles to the Flat Plates and reaching well up their edges, would be necessary for reliable performance.

As with any other Meccano part, the constructor should always have a keen eye open for exploiting the Flanged Plate and Flat Plate. To give a simple example, a lift cage of rigid construction with centralising guides can be built from two of No. 52, two of No. 72, four of No. 10 and *four* of No. 37! The reader is invited to try this one for himself!

Description of Plate		Part No.
Flanged Plate	5½ in. × 2½ in.	52
,, ,,	3½ in. × 2½ in.	53
,, ,,	2½ in. × 1½ in.	51
Flanged Sector Plate	4½ in. long	54
Flat Plate	5½ in. × 3½ in.	52a
,, ,,	5½ in. × 2½ in.	70
,, ,,	4½ in. × 2½ in.	53a
,, ,,	2½ in. × 2½ in.	72
,, ,,	3 in. × 1½ in.	73
,, ,,	1½ in. × 1½ in.	76
Triangular Plate	2½ in. side	76
,, ,,	1 in. side	77

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DUMPER TRUCK (*continued from page* 185)

Load Body

In the case of the load body, or dumper bucket, two Flanged Sector Plates 28 are bolted to a $5\frac{1}{2} \times 4\frac{1}{2}$ in. compound flexible plate 29, built up from two $5\frac{1}{2} \times 4\frac{1}{2}$ in. Flexible Plates, the securing Bolts helping to fix in position a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 30 and a $5\frac{1}{2}$ in. Strip 31. The upper flange of the Sector Plates are braced by another $5\frac{1}{2}$ in. Strip 32, bolted between them, while a Trunnion 33 and a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 34 are secured to the centre underside of Strip 31. The lugs of the Double Angle Strip later serve as the bucket hinges.

A mounting for the bucket assembly is built up from a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 35 which is attached by Angle Brackets to Flanged Plate 10. Two $5\frac{1}{2}$ in. Strips 36 are then bolted one to the lower end of each flange of this Plate, the opposite end of each Strip being bolted, along with a right-angled Rod and Strip Connector 37, to the apex of a Flat Trunnion 38. The base of the Flat Trunnion is bolted to a $5\frac{1}{2}$ in. Strip secured to front Double Angle Strip 2. The bucket is pivotally attached to the mounting by a 5 in. Rod passed through the lugs of Double Angle Strip 34 and held in right-angled Rod and Strip Connectors 37. Spring Clips on the Rod outside the Double Angle Strip lugs keep the bucket centrally situated.

Last of all, a simple control mechanism for tipping the bucket is provided by a length of Cord, one end of which is tied to the lower end of a lever, built up from a $2\frac{1}{2}$ in. Strip 39 pivotally mounted between the lugs of a $1 \times \frac{1}{2}$ in. Double Bracket bolted to Flanged Plate 10. The Cord is first brought back and around two 4 in. Rods 40, held by Spring Clips in vertically adjacent holes of Flat Plates 17. It is then taken forward and over a compound rod, supplied by two 2 in. Rods joined by a Rod Connector, to be finally tied to the apex of Trunnion 33.

With this control arrangement, the bucket will tip when the lever is pulled back, although the bucket must be restored by hand to its original position. This "one-way" control, however, does not detract noticeably from the fun!

PARTS REQUIRED

9—2	1—15	20—38	4—59
2—3	1—15a	2—38d	2—90a
4—5	2—15b	1—40	6—111c
4—6a	2—17	1—45	1—126
2—8	2—18a	2—48	4—126a
7—10	2—22	1—48a	1—147b
2—11	2—24	2—48b	4—187
1—11a	2—34	1—51	3—188
14—12	11—35	1—52	2—189
1—12a	1—36	2—53	4—190
2—12c	130—37a	2—53a	2—192
1—14	100—37b	2—54	2—212a
			1—213
			2—221

AMONG THE MODEL-BUILDERS (*continued from page* 187)

the basin. It so happens that the $1\frac{1}{2}$ in. Motor Tyre is a nice push-fit inside a Boiler End so it makes a neat simulation of the inverted rim of the dental basin. Even a plug-hole is provided by an electrical Terminal Nut ('stainless steel' again!) which has a few turns on the threads of a 4 in. Screwed Rod. This simply passes right through the stack of small and large Washers forming the pedestal, two 8-hole Wheel Discs 8, with their holes staggered, forming the pedestal base. Finally, the Screwed Rod is secured below the baseplate by a Washer and Nut—what could be simpler?

Construction of the electric 'drill' is also very simple. The motor is supplied by yet another Chimney Adaptor 9, capped with a small and a large Washer, the Bolts shown being passed into the threaded bores of an internal Collar mounted on a 1 in. Axle Rod. The Collar, in turn, is attached to the lower end of a Coupling, mounted on the chair pivot rod and carrying a 4 in. Key-way Rod in its longitudinal bore. This allows a short length of Spring Cord to lie partially inside the key-way, thus simulating a Bowden drive from the motor. Teased-out ends of the Spring Cord are trapped by Grub Screws in the Coupling and in a Threaded Coupling 10 fixed on the upper end of the Key-way Rod. The final drill cable—six inches of Spring Cord—is locked in one of the tapped bores of the Threaded Coupling, a Wire Hook being secured at the other end of this coupling to hold the drill 'bit' which is represented by a Coupling Screw for Spring Cord, Part No. 58a.

It only remains for me to invite readers to take it from here, remembering never to be put off by small models—they can exercise the imagination and ingenuity of the constructor every bit as much as the super model, and they offer great scope for a handful of parts in a limited space.

PARTS REQUIRED
(Basic chair only)

2—5	12—38	1—59	1—179
2—6	1—47	1—64	1—194b
1—16a	2—48a	2—111c	1—194e
20—37	1—51	1—115a	

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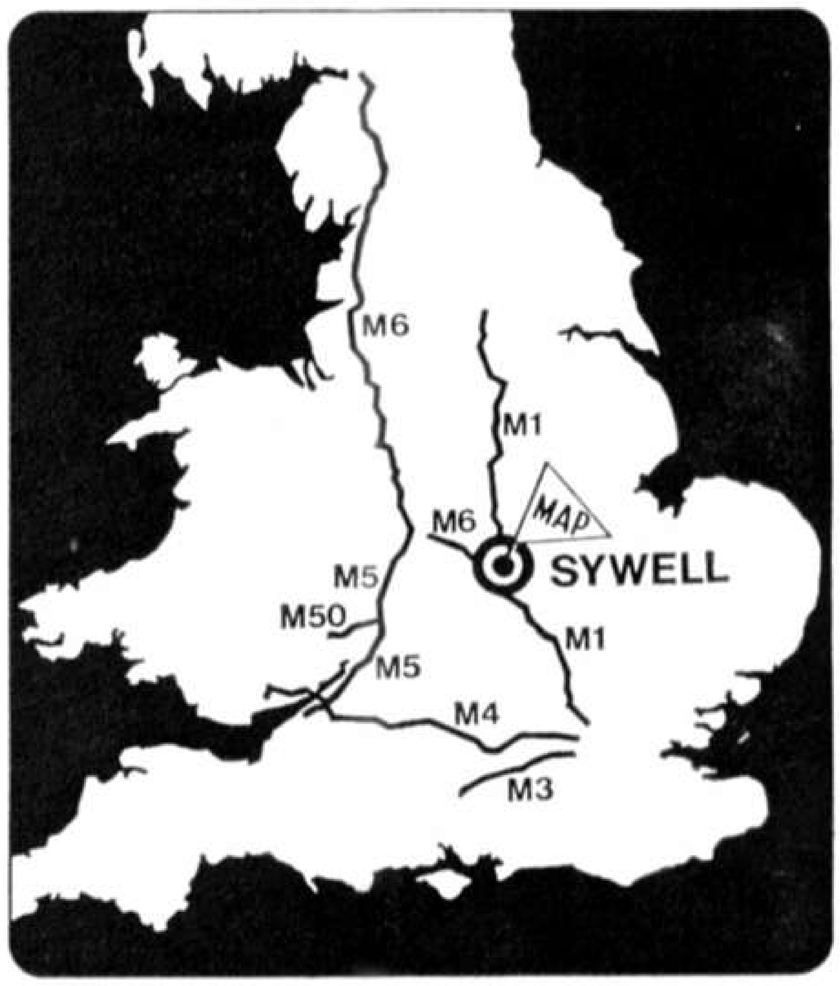

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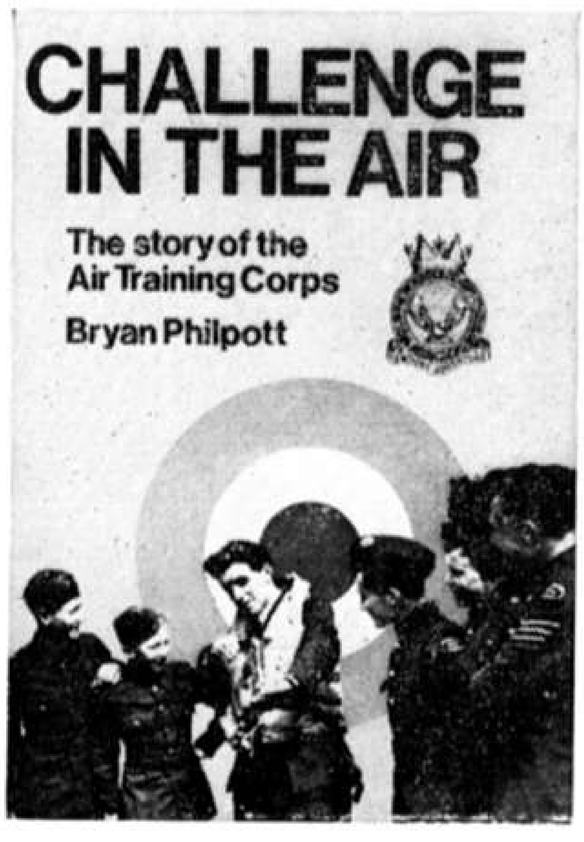

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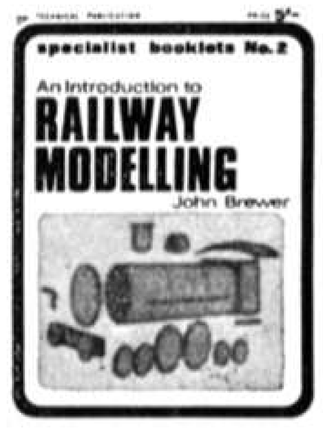

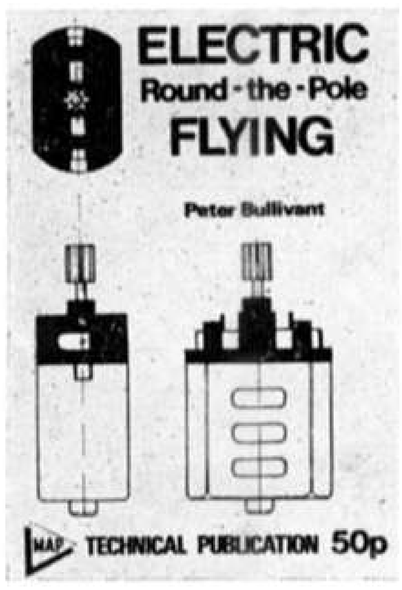

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